Eagle Series

EAGLE™ 2000 SERIES SMALL STERILIZERS
Vacamatic™

(11/79) P-764084-001

AMSCO ~~ESA 3445~~ SALES

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TABLE OF CONTENTS

Section	Paragraph	Title	Page
1		GENERAL INFORMATION	1-1
	1.1	APPLICATION AND DESIGN	1-1
2		OPERATING INSTRUCTIONS	2-1
	2.1	GENERAL	2-1
	2.2	BEFORE OPERATING THE EQUIPMENT	2-1
	2.3	AUTOMATIC OPERATION: PREVACUUM CYCLE	2-3
	2.4	AUTOMATIC OPERATION: GRAVITY CYCLE	2-3
		TABLE 2-1. MINIMUM STERILIZATION EXPOSURE PERIOD — WRAPPED AND UNWRAPPED GOODS GRAVITY CYCLE	2-4
	2.5	AUTOMATIC OPERATION: LIQUIDS CYCLE	2-5
		TABLE 2-2. MINIMUM RECOMMENDED EXPOSURE TIMES FOR FULL LOAD OF SQUARE-PAK® FLASKED SOLUTIONS	2-5
	2.6	MANUAL OPERATION: GRAVITY OR LIQUIDS CYCLE	2-6
	2.7	CONTROL MONITORING AND COMMUNICATION SYSTEMS	2-7
	2.8	CONTROLS AND SIGNALS FOR DOUBLE-DOOR STERILIZERS	2-9
3		PRINCIPLES OF OPERATION	3-1
	3.1	GENERAL	3-1
	3.2	THEORETICAL PRINCIPLES OF OPERATION: MECHANICAL	3-1
	3.3	CONTROLS	3-3
	3.4	CYCLE DESCRIPTIONS	3-4
	3.5	FUNCTIONAL DESCRIPTION OF EAGLE MICROCOMPUTER CONTROLLER	3-7
4		INSPECTION AND MAINTENANCE	4-1
	4.1	GENERAL	4-1
	4.2	ROUTINE INSPECTION	4-1
	4.3	PREVENTIVE MAINTENANCE	4-1
	4.4	CLEANING	4-5
5		FIELD TEST PROCEDURE	5-1
	5.1	GENERAL	5-1
	5.2	TEST INSTRUMENTATION REQUIRED	5-1
	5.3	CHECK FOR PROPER INSTALLATION	5-1
		TABLE 5-1. STERILIZER CONNECTIONS	5-1
	5.4	ADJUSTMENT OF COOLING WATER VALVES AND SLOW EXHAUST VALVE	5-2
	5.5	INSTALLATION OF POTENTIOMETER LEADS	5-2
	5.6	INSTALLATION OF COMPOUND PRESSURE GAUGE	5-2
	5.7	DOOR SWITCH ADJUSTMENT FOR DOOR WITH NEW GASKET	5-3
	5.8	SAFETY VALVE TEST	5-3
	5.9	ADJUSTMENT OF PRESSURE AND VACUUM SWITCHES	5-4
	5.10	CHAMBER VACUUM LEAK TEST	5-5
	5.11	OPERATIONAL CHECKS	5-6

TABLE OF CONTENTS

Section	Paragraph	Title	Page
5		TABLE 5-2. LIQUIDS CYCLE	5-6
		TABLE 5-3: GRAVITY CYCLE	5-7
		TABLE 5-4. PREVACUUM CYCLE	5-8
		TABLE 5-5. MANUAL OPERATION	5-9
6		TROUBLESHOOTING	6-1
	6.1	HELPFUL HINTS	6-1
	6.2	HOW TO USE THE CYCLE GRAPHS	6-2
	6.3	TROUBLESHOOTING CHART — EXPLANATION	6-6
		TABLE 6-1. TROUBLESHOOTING CHART	6-6
	6.4	TIMER DISPLAY CHECKOUT AND CORRECTION CHARTS	6-20
		TABLE 6-2. TEST PATTERNS — THUMBWHEEL SWITCHES	6-20
		TABLE 6-3. CONTINUITY CHECK — THUMBWHEEL SWITCHES	6-21
7		COMPONENT REPAIR, REPLACEMENT, AND ADJUSTMENT	7-1
	7.1	GENERAL	7-1
	7.2	INDICATOR-RECORDER-CONTROLLER	7-1
	7.3	CHAMBER DOOR ASSEMBLY	7-2
	7.4	AIR FILTER ASSEMBLY	7-5
	7.5	SOLENOID VALVES	7-5
	7.6	STEAM TRAP	7-6
	7.7	STRAINERS	7-7
	7.8	CHECK VALVES	7-7
	7.9	VACUUM BREAKER	7-7
	7.10	STEAM CONTROL VALVE, HI-LO	7-7
	7.11	VALVE ASSEMBLY, ANGLE	7-8
	7.12	CONTROL COLUMN	7-9
	7.13	DOOR SWITCH	7-11
	7.14	ADJUSTMENT OF PRESSURE AND VACUUM SETTINGS	7-11
	7.15	ADJUSTMENT FOR STERILIZATION BELOW 250° F (121° C)	7-13
8		EXPLODED VIEWS AND PARTS LIST	8-1

LIST OF ILLUSTRATIONS

Figure	Title	Page
2-1	CHANGING THE CHART	2-1
2-2	CONTROL LOCATIONS: Operating End	2-2
2-3	MONITORS AND ALARMS	2-8
2-4	NON-OPERATING END PRIMARY CONTROL PANEL	2-9
3-1	PIPING DIAGRAM: Vacamatic Sterilizer	3-2
3-2	EAGLE 5-VOLT POWER SUPPLY	3-7
3-3	EAGLE 28-VOLT POWER SUPPLY	3-8
3-4	CPU PRINTED CIRCUIT BOARD 146586	3-9
3-5	I/O #1 PRINTED CIRCUIT BOARD 146588	3-11
4-1	SAMPLE PREVENTIVE MAINTENANCE RECORD	4-2
4-2	LOCATION OF CHAMBER DRAIN STRAINER	4-5
4-3	LUBRICATING CHAMBER DOOR	4-5
4-4	LOCATION OF STEAM TRAPS AND SAFETY VALVES	4-6
5-1	LEVELING THE STERILIZER	5-1
5-2	ADJUSTMENT OF COOLING WATER VALVES AND SLOW EXHAUST VALVE	5-2
5-3	GAUGE INSTALLATION	5-2
5-4	LOCKING DOOR TO CORRECT TORQUE	5-3
5-5	DOOR SWITCH ADJUSTMENT	5-3
5-6	ADJUSTING PRESSURE REGULATOR	5-4
5-7	ADJUSTMENT OF PRESSURE AND VACUUM SWITCHES	5-5
6-1	CYCLE GRAPH: PREVACUUM CYCLE	6-2
6-2	CYCLE GRAPH: GRAVITY CYCLE	6-3
6-3	CYCLE GRAPH: LIQUIDS CYCLE	6-4
6-4	CIRCUIT BOARDS WITH LEDs	6-5
6-5	ELECTRICAL SCHEMATIC	6-22/6-23
6-6	P/C ASSEMBLY: Basic	6-28/6-29
6-7	P/C ASSEMBLY: Vacamatic Expander	6-32/6-33
6-8	P/C ASSEMBLY: Power Supply	6-36/6-37
6-9	PIPING SCHEMATIC	6-40/6-41
7-1	REPLACING THE RECORDER	7-2
7-2	DIRECT-ACTING SOLENOID VALVE	7-5
7-3	INTERNAL PILOT-OPERATED SOLENOID VALVE	7-6
7-4	HI-LO VALVE ADJUSTMENT	7-8
7-5	CONTROL CONSOLE	7-9
7-6	LAMP REPLACEMENT	7-9
7-7	CLIP AND REMOVE R-24	7-9
7-8	REMOVING A PRINTED CIRCUIT CARD	7-10
7-9	SETTING THE PULSE SWITCH	7-10
7-10	LOCATION OF SOLENOID VALVES	7-12
7-11	ADJUSTING PRESSURE REGULATOR	7-13
7-12	PRESSURE REGULATOR SETTINGS	7-14

LIST OF ILLUSTRATIONS

Figure	Title	Page
8-1	CABINET ASSEMBLY: Freestanding Sterilizer	8-2
8-2	SIDE FRAME ASSEMBLY: Freestanding Sterilizer	8-4
8-3	CABINET ASSEMBLY: Double Door, Recessed	8-6
8-4	SIDE FRAME ASSEMBLY: Recessed Sterilizer	8-8
8-5	PANEL ASSEMBLY: Operating End	8-10
8-6	SUB PANELS: Operating End	8-12
8-7	TOP CONTROL PANEL: Operating End	8-14
8-8	PANEL ASSEMBLY: Non-Operating End	8-16
8-9	SHELL AND STAND ASSEMBLY	8-18
8-10	CONTROL COLUMN (Part 1 of 3)	8-20
8-11	CONTROL COLUMN (Part 2 of 3)	8-22
8-12	CONTROL COLUMN (Part 3 of 3)	8-24
8-13	INDICATOR-RECORDER-CONTROLLER (Part 1 of 2)	8-26
8-14	INDICATOR-RECORDER-CONTROLLER (Part 2 of 2)	8-28
8-15	MAIN CONTROL ASSEMBLY	8-30
8-16	SECONDARY CONTROL PANEL (Part 1 of 2)	8-32
8-17	SECONDARY CONTROL PANEL (Part 2 of 2)	8-34
8-18	COVER AND HANDWHEEL ASSEMBLY	8-36
8-19	DOOR LOCK AND HINGE ASSEMBLY	8-38
8-20	DOOR ASSEMBLY	8-40
8-21	DOOR SWITCH ASSEMBLY	8-42
8-22	PIPING ASSEMBLY, Complete	8-44
8-23	PIPING SUBASSEMBLY, Top	8-46
8-24	PIPING SUBASSEMBLY, Side	8-48
8-25	PIPING SUBASSEMBLY, Bottom	8-50
8-26	STEAM SUPPLY ASSEMBLY	8-52
8-27	WATER SUPPLY ASSEMBLY	8-54
8-28	AIR BREAK ASSEMBLY	8-56
8-29	EJECTOR ASSEMBLY	8-58
8-30	DRAIN ASSEMBLIES	8-60
8-31	STEAM CONTROL VALVE	8-62
8-32	FILTER ASSEMBLY	8-64
8-33	UNION ANGLE VALVE	8-66
8-34	STEAM TRAP	8-68
8-35	OPTIONAL MANUAL VALVE PIPING	8-70
8-36	OPTIONAL MANUAL VALVE	8-72
8-37	WIRING ASSEMBLY	8-74
8-38	CONNECTION DETAILS: Control Column	8-76
8-39	DOOR SWITCH CABLE ASSEMBLY (Single Door Models)	8-78
8-40	DOOR SWITCH CABLE ASSEMBLY (Double Door Models)	8-80
8-41	CABLE ASSEMBLY: Pressure and Vacuum Switches	8-82
8-42	CABLE ASSEMBLY: Solenoid Valves	8-84
8-43	HARNESS ASSEMBLY	8-86
8-44	WIRING HARNESS: Secondary Panel	8-88
8-45	OPTIONAL RACK AND SHELVES	8-92
8-46	OPTIONAL LOADING CAR ASSEMBLY	8-93
8-47	OPTIONAL TRANSFER CARRIAGE ASSEMBLY	8-94

SUMMARY OF SAFETY PRECAUTIONS

The following are personnel (WARNINGS) and equipment (CAUTIONS) safety precautions to be observed when operating or servicing this Sterilizer. The page or pages on which they appear in the text of this manual are indicated by the number in the lower right-hand corner of the precautions.

WARNING: TO PREVENT POSSIBLE PERSONAL INJURY OR PROPERTY DAMAGE RESULTING FROM BURSTING BOTTLES AND HOT FLUID, YOU MUST FOLLOW THE PROCEDURE LISTED ON PAGE 2-5.

2-5

WARNING: WHEN OPERATING A LIQUIDS CYCLE YOU MUST OBSERVE THE PRECAUTIONS LISTED IN PARAGRAPH 2.5. FAILURE TO FOLLOW THESE PRECAUTIONS COULD RESULT IN PERSONAL INJURY OR PROPERTY DAMAGE.

2-6

WARNING: SUDDEN FULL OPENING OF THE DOOR FOLLOWING A LIQUIDS STERILIZATION CYCLE COULD CAUSE LIQUIDS TO BOIL OVER OR BOTTLES TO BURST. TO PREVENT POSSIBLE PERSONAL INJURY, FOLLOW PROCEDURES COVERED IN THIS MANUAL.

2-6, 2-7

WARNING: BE SURE TO PRESS THE POWER AND CONTROL SWITCHES TO OFF AND WAIT UNTIL CHAMBER COOLS TO ROOM TEMPERATURE BEFORE STARTING ANY MAINTENANCE OPERATIONS.

4-1

WARNING: BE CAREFUL IF STEAM IS ESCAPING FROM SAFETY VALVE. TO PREVENT BURNS, WEAR GLOVES OR USE AN EXTENSION DEVICE IF IT BECOMES NECESSARY TO OPERATE THE TRY LEVER.

4-5, 5-3

CAUTION: Never use wire brush or steel wool on door and chamber assembly.

4-6

CAUTION: When using AMSCO Stainless Steel Cleaner and Polish or AMSCO Pry Cleaner, rub in a back-and-forth motion (in the same direction as the surface grain). Do not rub with a rotary or circular motion. Do not use these cleaners on plastic or painted surfaces. Follow directions on containers.

4-6

CAUTION: Do not open ball valve when there is positive pressure in sterilizer.

5-2

CAUTION: Because of excessive current draw, do not use an incandescent or neon type test light for the Vacuum and Pressure switch tests.

5-4, 7-12

SUMMARY OF SAFETY PRECAUTIONS

CONTINUED

CAUTION: If primary panel output is not present, make short circuit test between pins 6 and 2 of receptacle J10 on Mother Board before connecting new power supply. If short circuit is found it must be isolated and repaired prior to connecting new supply.

6-9

CAUTION: If safety valve is found to be defective, do not attempt to repair. Replace it with new valve.

6-15

CAUTION: Recorders should be handled with care, and caution should be exercised when making changes to ensure against kinking or compressing the capillary system. The bulb, tubing and pressure element are filled with a fluid approved by the Scientific Instrument Makers Association and form a sealed system. This system must never be broken. Even the most minute leak will render it inoperative. Excess capillary should be formed into an 8-inch diameter coil and properly supported by taping to any smooth unheated surface.

7-1

CAUTION: The door post (8-20, 10) is welded to the lock clutch ring. If it is necessary to disassemble the door further, contact AMSCO for instruction for removing weld and rewelding.

7-3

CAUTION: Allow thermostatic traps to cool to room temperature before removing cover. Since there is nothing to limit expansion, the diaphragm may rupture or fatigue if trap is opened while hot.

7-6

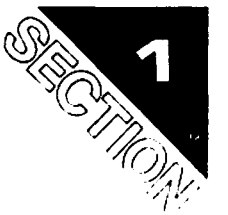
CAUTION: Solenoid valves are equipped with a special material which can be attacked by oils and grease. When replacing entire valve, wipe threads clean of cutting oils and use Teflon tape to seal pipe joints. 7-6

CAUTION: Handle syiphon and bellows assembly gently, to avoid damage.

7-7

CAUTION: Use extreme care when opening a container of electronic parts. Avoid circumstances wherein a build-up of static electricity could discharge.

7-10



SECTION 1

GENERAL INFORMATION

1.1 APPLICATION AND DESIGN

The product literature included in this section contains factual data relating to the principal descriptive and identifying characteristics of particulars for EAGLE sterilizers. The literature is informational rather than instructional. It provides and conveys, textually and illustratively, a general concept of the equipment, its purpose, capabilities, limitations, and technical specifications.

SECTION 2

SECTION 2

OPERATING INSTRUCTIONS

2.1 GENERAL

The following instructions are intended to guide maintenance personnel when: (1) instructing operators in techniques designed to ensure optimum equipment performance; and (2) verifying the validity of operator complaints. See Section 6, TROUBLESHOOTING, if the sterilizer is not operating properly. Refer to Section 1, GENERAL INFORMATION, for capabilities of the equipment. If you are unfamiliar with this equipment, or you wish to review the principles by which the sterilizer operates, you are urged to read Section 3, PRINCIPLES OF OPERATION, before beginning actual operation.

Figure 2-2 shows the location of the various controls.

2.2 BEFORE OPERATING THE EQUIPMENT

1. Be sure that chamber drain strainer is clean and in place and that chamber interior is clean (para. 4.4).

2. Open the upper access door.

a. If sterilizer has a manual control, make sure it is turned to OFF.

b. Turn STEAM and WATER valves to ON. Steam is admitted to jacket and will begin to warm chamber. If HI-LO valve is on HI, jacket pressure will stabilize at 32 psig; if on LO, it will stabilize at 20 psig.

3. Open the door on the secondary control panel and position the POWER and CONTROL switches to ON. Primary control panel lights up. If door(s) is open, status light DOOR UNLOCKED (and OPPOSITE DOOR UNLOCKED, for double-door units) will be on. STERILIZE TIME and DRY TIME digital readouts will agree with settings on thumbwheel switches on secondary panel. Cycle selectors will be dimly lit.

4. Install a new paper chart on the indicator-recorder-controller at the beginning of each day.

5. Review paragraph 2.7, "Control Monitoring and Communication Systems," in order to identify the cause of any abnormal condition during a sterilization cycle. Warning signals are an intermittent buzzer and the flashing on and off of the appropriate panel status light: CONDITION, DOOR UNLOCKED, STERILIZE.

6. If a double-door unit, review paragraph 2.8 to become familiar with the controls on the non-operating end.

7. Follow instructions in paragraph 4.3 for daily preventive maintenance procedure.

8. Wait until jacket pressure has stabilized, as indicated by jacket pressure gauge, before starting a cycle.

NOTE: In case of inadvertent, incorrect cycle selection, operator should press cycle RESET pushbutton on secondary panel. Overload circuit breaker, RECIRCUIT, is also located on the secondary panel, beside cycle RESET. Other abnormal conditions which require cycle reset are described in paragraph 2.7, "Control Monitoring and Communications Systems."

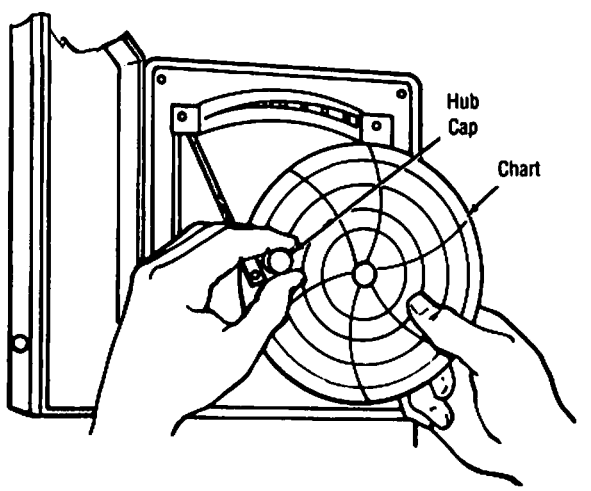


Figure 2-1. CHANGING THE CHART.

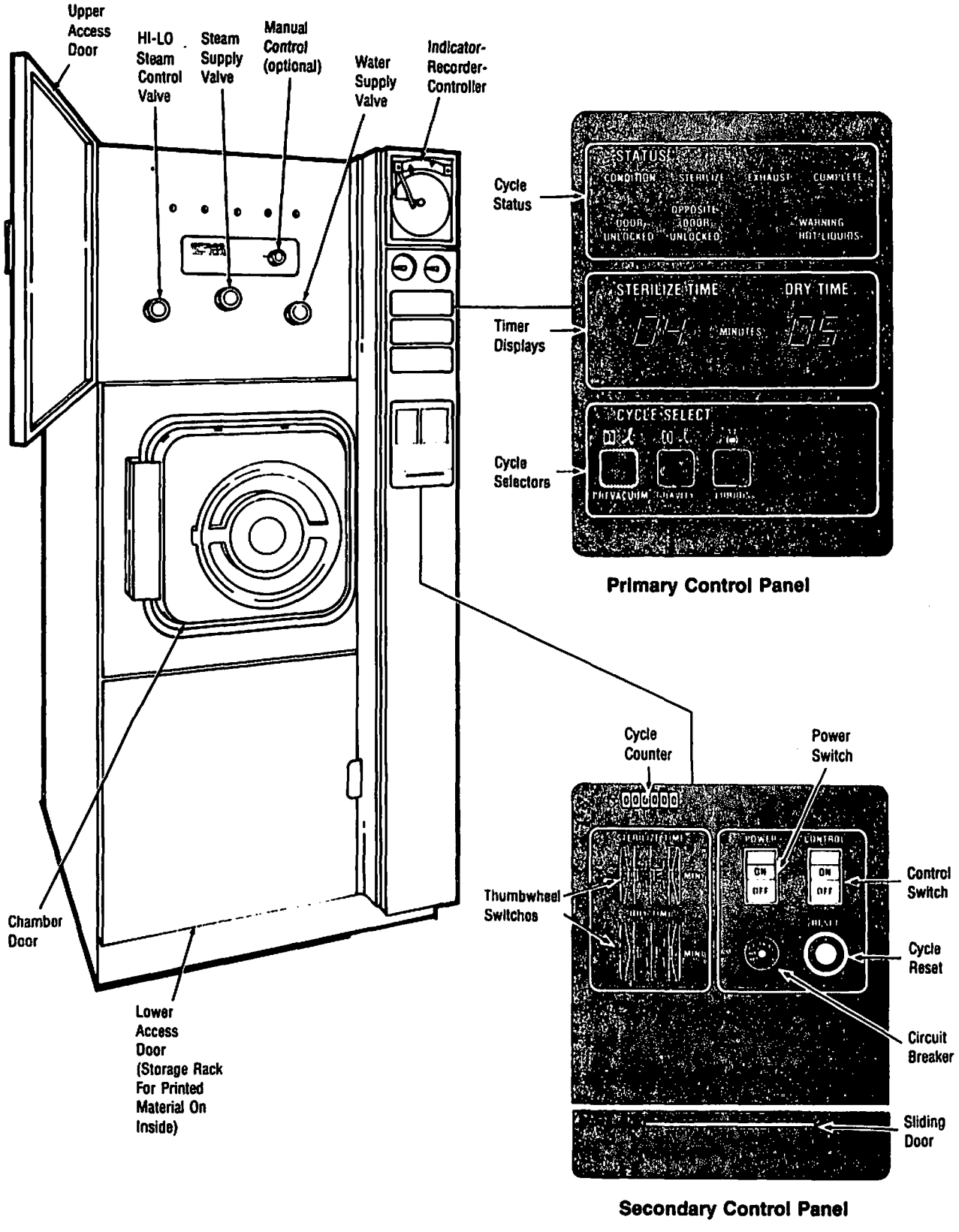


Figure 2-2. CONTROL LOCATIONS: Operating End.

2.3 AUTOMATIC OPERATION: PREVACUUM CYCLE (WRAPPED AND UNWRAPPED GOODS)

1. Follow instructions in paragraph 2.2, "Before Operating the Equipment."

2. Open the upper access door and turn HI-LO valve to HI. Verify that STEAM and WATER valves are ON.

3. Open the door on the secondary panel.

a. Be sure the POWER and CONTROL switches are ON. Primary control panel should be lit.

NOTE: Set times are displayed on the primary control panel. Once the cycle is started, these times are locked in and cannot be changed.

b. For routine loads, dial 04 minutes on STERILIZE TIME thumbwheel switches and 05 minutes on DRY TIME thumbwheel switches.

4. Set the yellow pointer on the indicator-recorder-controller to 270° F (132° C).

5. Open chamber door and load sterilizer. Should the door not at first unlock, turn door wheel slightly clockwise, press the center black button, then again turn door wheel counterclockwise and open. Turn handwheel to extreme left to bring ends of holding arms inward so that they will not strike door frame when door is opened or closed.

6. Close and lock the door . . . turn handwheel to the right as far as it will go using normal hand pressure. Panel light DOOR UNLOCKED (also OPPOSITE DOOR UNLOCKED if applicable) must go off. Once chamber is pressurized, as indicated by chamber pressure gauge, an integral pressure-actuated lock will prevent door from being opened.

7. Touch PREVACUUM cycle selector. Light comes on to full brightness. Status light CONDITION comes on.

NOTE: If you push the wrong cycle selector, simply press and release the RESET pushbutton on the secondary panel. Earlier selected cycle light will go out. Touch selector for correct cycle. Cycle light will come on; status light CONDITION will come on and new cycle will begin.

8. After condition phase is completed, STERILIZE light comes on and remains on for the duration of the sterilize phase. Steam STERILIZE TIME digital readout begins to count down when sterilizing temperature is reached.

9. When sterilize timer times out, EXHAUST light comes on. Steam DRY TIME digital readout begins to count down when chamber is exhausted to 3 psig. Chamber continues to be exhausted until a vacuum is drawn in the chamber.

10. When dry timer times out, air is admitted to the chamber to relieve the vacuum. When vacuum is sufficiently relieved, to approximately 2" Hg, COMPLETE light comes on, and buzzer sounds for 90 seconds or until door is opened — see step 5. Sterilized goods may be removed from the machine.

11. When chamber door is opened, controls will automatically reset and DOOR UNLOCKED light will come on.

NOTE: If sterilization procedures routinely require fast processing of standard wrapped instrument trays, the number of prevacuum pulses may be increased for a shorter total sterilization period and greater productivity. See paragraph 7.12, for instructions on changing the number of pulses from the standard four.

2.4 AUTOMATIC OPERATION: GRAVITY CYCLE

1. Follow instructions in paragraph 2.2, "Before Operating the Equipment."

NOTE: For cycle temperatures below 250° F (121° C), refer to paragraph 7.15.

2. Refer to Table 2.1 and select the desired sterilizing temperature. Open the upper access door and turn HI-LO valve to HI for the 270° F (132° C) sterilization cycle, or to LO for the 250° F (121° C) sterilizing cycle. Verify that STEAM and WATER valves are on.

3. Open the door on the secondary control panel.

a. Be sure the POWER and CONTROL switches are ON. Primary control panel should be lit.

NOTE: Set times are displayed on the primary control panel. Once the cycle is started, these times are locked in and cannot be changed.

b. Dial the correct exposure period (Table 2.1) on STERILIZE TIME thumbwheel switches.

c. Dial the desired drying period on DRY TIME thumbwheel switches. For wrapped goods, 5 minutes is recommended. For unwrapped goods, drying time is not required; however, a minimum of 02 minutes will eliminate excess steam vapors prior to opening chamber door.

4. Set the yellow pointer on the indicator-recorder-controller to 270° F (132° C) or to 250° F (121° C).

5. Open chamber door and load sterilizer. Should the door not at first unlock, turn door wheel slightly clockwise, press the center black button, then again turn door wheel counterclockwise and open. Turn handwheel to extreme left to bring ends of holding arms inward so that they will not strike door frame when door is opened or closed.

6. Close and lock the door ... turn handwheel to the right as far as it will go using normal hand pressure. Panel light DOOR UNLOCKED (also OPPOSITE DOOR UNLOCKED if applicable) must go off. Once chamber is pressurized, an integral pressure-actuated lock will prevent door from being opened.

NOTE: If you push the wrong cycle selector, simply press and release the RESET pushbutton on the secondary panel. Earlier selected cycle light will go out. Touch selector for correct cycle. Cycle light will come on; status light CONDITION will come on and new cycle will begin.

7. Touch GRAVITY cycle selector. Light comes on to full brightness. Status light CONDITION comes on.

8. After condition phase is completed, STERILIZE light comes on and stays on for the duration of the sterilize phase. STERILIZE TIME digital readout begins to count down when sterilizing temperature is reached.

9. When sterilize timer times out, EXHAUST light comes on. Chamber exhausts to atmospheric pressure. If a drying period was selected, DRY TIME digital readout begins to count down. If zero DRY TIME was selected, cycle proceeds to next step.

10. When exhaust phase is completed, panel light COMPLETE comes on and buzzer sounds for 90 seconds or until door is opened. Open chamber door (see step 5). Load may be removed from the sterilizer.

11. When chamber is opened, controls will automatically reset and DOOR UNLOCKED light will come on.

TABLE 2-1. MINIMUM STERILIZATION EXPOSURE PERIOD — WRAPPED AND UNWRAPPED GOODS GRAVITY CYCLE ONLY

ITEMS	RECORDER SETTING	
	250° F (121° C) MINUTES	270° F (132° C) MINUTES
Dressing, wrapped in paper or muslin	30	15
Glassware, empty, inverted	15	3
Instruments, metal only, any number (unwrapped)	15	3
Instruments, metal, combined with suture, tubing or other porous materials (unwrapped)	20	10
Instruments, wrapped in double thickness muslin	30	10
Linen packs (maximal size: 12"x12"x20"; maximal weight 12 pounds)	30	—
Rubber gloves, wrapped in muslin or paper	20	10
Treatment trays, wrapped in muslin or paper	30	10
Utensils, unwrapped	15	3
Utensils, wrapped in muslin or paper	20	10

2.5 AUTOMATIC OPERATION: LIQUIDS CYCLE

WARNING: TO PREVENT THE POSSIBE PERSONAL INJURY OR PROPERTY DAMAGE RESULTING FROM BURSTING BOTTLES AND HOT FLUID, YOU MUST FOLLOW THE PROCEDURE LISTED BELOW.

1. Use only vented closures – do not use screw caps or rubber stoppers with crimped seal.

2. Use only Type I borosilicate (Pyrex) glass bottles – do not use ordinary glass jugs or any container not designed for sterilization.

3. Use sterilizer LIQUIDS cycle. No other cycle is safe for liquid sterilization.

4. At end of cycle, open sterilizer door, no more than 1/2 inch. Wait 10 minutes before unloading sterilizer.

5. Do not allow hot bottles to be jolted. This can cause hot-bottle explosions! Do not move bottles if any boiling or bubbling is present.

6. Bottles should be cool to touch before attempting to move them from sterilizer loading car or shelves to the storage area.

1. Follow instructions in paragraph 2.2, "Before Operating The Equipment."

NOTE: For cycle temperatures below 250° F (121° C), refer to paragraph 7.15.

2. Open the upper access door and turn HI-LO valve to LO. Verify that STEAM and WATER valves are on.

3. Open the door on the secondary control panel.

a. Be sure the POWER and CONTROL switches are ON. Primary control panel should be lit.

NOTE: Set time will be displayed on the primary control panel; however, during a LIQUIDS cycle, controller automatically disregards any DRY time setting and blanks out that portion of the display. Once the cycle is started, the STERILIZE time will be locked in and cannot be changed.

b. Set STERILIZE timer thumbwheels to appropriate time ... see Table 2.2.

4. Set the yellow pointer on the indicator-recorder-controller to 250° F (121° C).

5. Open chamber door and load sterilizer. Should the door not at first unlock, turn door wheel slightly clockwise, press the center black button, then again turn door wheel counterclockwise and open. Turn handwheel to extreme left to bring the ends of the holding arms inward so that they will not strike the door frame when door is opened or closed.

6. Close and lock the door ... turn handwheel to the right as far as it will go using normal hand pressure. Panel light DOOR UNLOCKED (also OPPOSITE DOOR UNLOCKED if applicable) must go off. Once chamber is pressurized, an integral pressure-actuated lock will prevent door from being opened.

NOTE: If you push the wrong cycle selector, simply press and release the RESET pushbutton on the secondary panel. Earlier selected cycle light will go out. Touch selector for correct cycle. Cycle light will come on; status light CONDITION will come on and new cycle will begin.

TABLE 2-2. MINIMUM RECOMMENDED EXPOSURE TIMES FOR FULL LOAD OF SQUARE-PAK® FLASKED SOLUTIONS 250° F (121° C) RECORDER SETTING

ASPF SIZE	TIME (MINUTES)
75 ML	25
250 ML	30
500 ML	40
1000 ML	45
1500 ML	50
2000 ML	55

7. Touch LIQUIDS cycle selector. Light comes on to full brightness. Status light CONDITION comes on; also WARNING HOT LIQUIDS light comes on.

8. After condition phase is completed, STERILIZE panel light comes on and stays on for the duration of the sterilize phase. STERILIZE TIME digital readout begins to count down when sterilizing temperature is reached.

9. When sterilize timer times out, EXHAUST light comes on and chamber exhausts slowly.

10. When exhaust phase is completed, COMPLETE light comes on and buzzer begins to sound.

WARNING: SUDDEN FULL OPENING OF THE DOOR FOLLOWING A STERILIZATION CYCLE COULD CAUSE LIQUIDS TO BOIL OVER OR BOTTLES TO BURST. TO PREVENT POSSIBLE PERSONAL INJURY, PROCEED AS FOLLOWS.

11. Crack the door open (see step 5) **about 1/2''** and leave it cracked for at least 10 minutes. Opening the door will stop buzzer and cause DOOR UNLOCKED light to come on. WARNING HOT LIQUIDS light will remain on, but will begin to flash ... continuing for 10 minutes. At the end of 10 minutes, buzzer will again sound and WARNING HOT LIQUIDS light will stay on. Buzzer sounds for two minutes or until RESET button is pushed.

12. Load may now be removed from sterilizer. Pressing RESET button on secondary control panel resets control and turns WARNING HOT LIQUIDS light off.

2.6 MANUAL OPERATION: GRAVITY (WRAPPED OR UNWRAPPED GOODS) OR LIQUIDS CYCLE

NOTE: Manual control is an optional feature on this sterilizer. The following procedure can be performed only if this sterilizer is so equipped. A prevacuum cycle cannot be achieved manually.

1. Follow steps 1, 2, and 7 in paragraph 2.2, "Before Operating The Equipment." If there is electricity to the sterilizer, positioning POWER switch on secondary control panel at ON will energize the Recorder. The CONTROL switch, however, must be positioned at OFF when using manual operation.

2. Open the upper access door.

3. Determine desired processing temperature (270° F [132° C] or 250° F [121° C] for Gravity cycle; 250° F [121° C] for Liquids cycle). As a reminder, the yellow pointer on the indicator-recorder-controller may be positioned to this temperature.

4. Set HI-LO valve as follows:

a. **For 250° F (121° C) operation** — refer to paragraph 7.15 for instructions on loosening front stop on pressure regulator; then turn valve counterclockwise until jacket pressure gauge reads between 15 and 18 psig (1.056 and 1.267 kg/cm^2).

NOTE: If normal LO setting is used for manual operation, chamber temperature will be approximately 258° F (126° C).

b. **For 270° F (132° C) operation** — set HI-LO valve so that pressure gauge reads between 28 and 30 psig (1.971 and 2.112 kg/cm^2).

WARNING: WHEN OPERATING A LIQUIDS CYCLE YOU MUST OBSERVE THE PRECAUTIONS LISTED IN PARAGRAPH 2.5. FAILURE TO FOLLOW THESE PRECAUTIONS COULD RESULT IN PERSONAL INJURY OR PROPERTY DAMAGE.

5. Open chamber door and load sterilizer. Should the door not at first unlock, turn door wheel slightly clockwise, press the center black button, then again turn door wheel counterclockwise and open. Turn handwheel to extreme left to bring ends of holding arms inward so that they will not strike door frame when door is opened or closed.

6. Close and lock the door. Turn handwheel to right as far as it will go using normal hand pressure. Once chamber is pressurized, an integral pressure-actuated lock will prevent door from being opened.

7. Turn the Manual Operation selector to Condition and wait for sixty seconds. Proceed to step 8.

8. After Condition phase, turn selector to Sterilize. When chamber temperature reaches desired temperature, begin timing. After correct sterilization period, proceed to next step.

WARNING: SUDDEN FULL OPENING OF THE DOOR FOLLOWING A LIQUIDS STERILIZATION CYCLE COULD CAUSE LIQUIDS TO BOIL OVER OR BOTTLES TO BURST. TO PREVENT POSSIBLE PERSONAL INJURY, PROCEED AS FOLLOWS.

9. a. **If a Liquids cycle, turn selector to Slow Exhaust and keep it in this position until chamber pressure is atmospheric (0 psig).** Then turn selector to Off position, **omitting** the Dry phase. Crack the door open **about 1/2''** and wait for at least 10 minutes.

9. b. **If a Gravity cycle,** you may either (1) turn the selector to the Fast Exhaust position until chamber pressure is atmospheric and then turn to Off; or (2) turn selector to the Dry position, if a drying period for wrapped goods is desired, and then to Off.

10. Load may be removed from the sterilizer.

2.7 CONTROL MONITORING AND COMMUNICATION SYSTEMS

To ensure the validity of the sterilizing process, the automatic control continually monitors the cycle. Should one of the following conditions occur, you will be notified as indicated.

CONDITION NO. 1: Sterilizer did not complete conditioning phase in preset time.

INDICATION: CONDITION light on primary control panel flashes and buzzer sounds intermittently.

OPERATOR SHOULD:

1. Touch cycle selector to stop buzzer (sterilizer will continue to operate).

2. Refer to Section 6 TROUBLESHOOTING to see if problem can be determined and corrected without interrupting cycle (e.g., HI-LO valve is incorrectly set).

3. If problem cannot be corrected so that conditioning phase can be completed (i.e., chamber reaches set sterilizing temperature), press cycle RESET button on secondary control panel to abort cycle. **Do not** proceed further until chamber is at atmospheric pressure.

4. When chamber is at atmospheric pressure:

a. **If a Liquids cycle** was in progress, crack door open 1/2'' and wait for at least 10 minutes.

b. Correct problem.

c. Reprocess load.

CONDITION NO. 2: Temperature drops 2° F below set point after initially reaching set point.

INDICATION: STERILIZE light on primary control panel flashes and STERILIZE timer display resets.

OPERATOR SHOULD:

1. Let cycle continue to completion if sterilizing temperature is reestablished.

2. If condition happens repeatedly, refer to Section 6 TROUBLESHOOTING to see if problem can be determined and corrected without interrupting cycle.

3. If problem cannot be corrected so that sterilizing phase can be completed, press cycle RESET button on secondary control panel to abort cycle. **Do not** proceed further until chamber is at atmospheric pressure.

4. When chamber is at atmospheric pressure:

a. **If a Liquids cycle** was in progress, **crack door open 1/2''** and wait for at least 10 minutes.

b. Correct problem.

c. Reprocess load.

CONDITION NO. 3: Cycle started, but chamber door not sufficiently tightened to keep door lock switch actuated.

INDICATION: DOOR UNLOCKED light(s) on primary control panel comes on and buzzer sounds intermittently.

OPERATOR SHOULD:

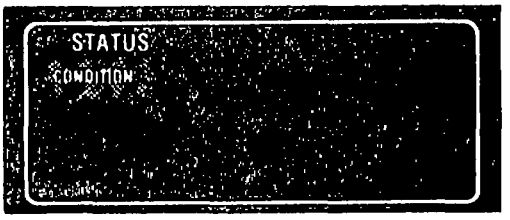
1. Press cycle RESET button on secondary control panel. **Do not** proceed further until chamber is at atmospheric pressure.

2. When chamber is at atmospheric pressure:

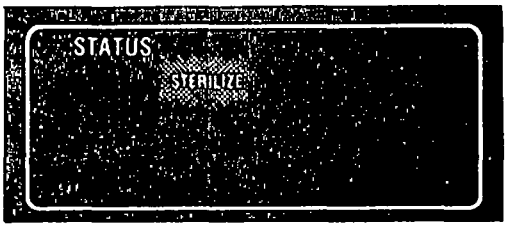
a. **If a Liquids cycle** was in progress, **crack door open about 1/2''** and wait for at least 10 minutes.

b. Check door and door switch operation.

c. Reprocess load.



No. 1 — Condition Phase Too Long.



No. 2 — Sterilizing Temperature Drops.

No. 3 — Chamber Door Switch Not Made.

CONDITION NO. 4: Loss of electricity.

INDICATION: Primary control panel goes dark.

OPERATOR SHOULD:

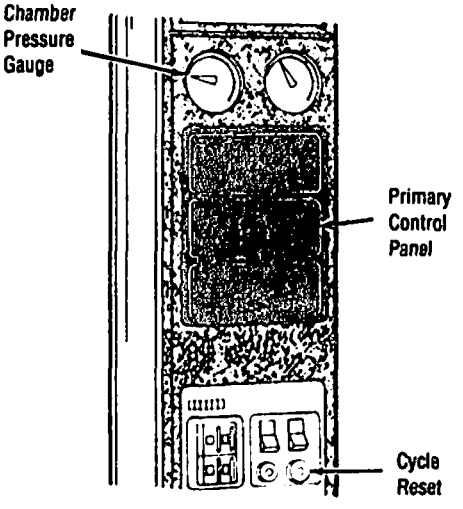
1. Wait until power is restored to sterilizer; then position CONTROL switch (on secondary control panel) to ON. Buzzer will sound intermittently.

2. Press cycle RESET button, but **do not** proceed until chamber is at atmospheric pressure.

3. When chamber is at atmospheric pressure:

a. **If a Liquids cycle** was in progress, **crack door open about 1/2''** and wait for at least 10 minutes, then reprocess load.

b. Other cycles, load may be reprocessed right away.



No. 4 — Loss of Electricity.

Figure 2-3. MONITORS AND ALARMS.

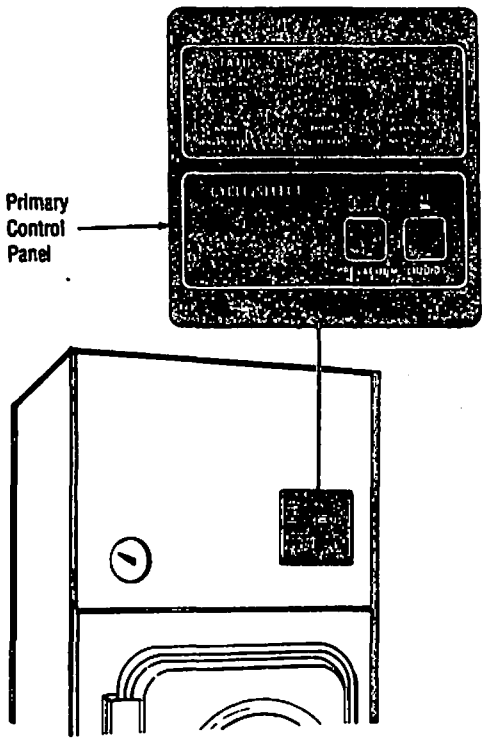


Figure 2-4. NON-OPERATING END PRIMARY CONTROL PANEL.

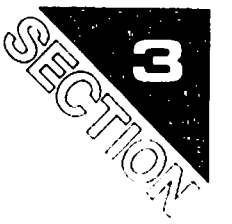
2.8 CONTROLS AND SIGNALS FOR DOUBLE-DOOR STERILIZERS (Fig. 2.4)

The following controls will be found on the non-operating end of the sterilizer:

1. Cycle selectors: **PREVACUUM** and **LIQUIDS.** If you wish to repeat the previous prevacuum or liquids cycle, and all preparatory actions (para. 2.2) have been made, you may do this from the non-operating end by touching the appropriate selector.

2. Status lights: These indicate the cycle phase which is currently in progress: CONDITION, STERILIZE, EXHAUST, COMPLETE.

3. Warning lights: DOOR UNLOCKED, OPPOSITE DOOR UNLOCKED, WARNING HOT LIQUIDS.



SECTION 3

PRINCIPLES OF OPERATION

3.1 GENERAL

The Vacamatic model sterilizer is designed to efficiently sterilize single and full loads of fabrics, wrapped and unwrapped hard goods, and solutions. To accomplish this, the sterilizer uses steam, regulated at the most effective temperature and pressure for the particular load. The control system offers three different sterilization cycles: Prevacuum, Gravity, and Liquids. The Liquids and Gravity cycles are conventional, gravity-displacement cycles, at the beginning of which air in the chamber is forced out by the introduction of steam. The Prevacuum cycle incorporates an initial conditioning phase which consists of a series of pressure/vacuum pulses. The purpose of the cycle is to quickly and thoroughly condition the load, thus permitting a relatively short sterilization cycle for suitable materials.

The control system and piping arrangement, described below, are designed to accomplish the work of sterilization efficiently and reliably. The heart of the control system is a microcomputer which is pre-programmed to control all sterilizing cycles from beginning to end, once the preparatory actions have been taken.

All sterilizers are equipped with manually operated steam and water supply valves and electrical disconnects. These isolate the unit from the general supply lines when in an off position.

3.2 THEORETICAL PRINCIPLES OF OPERATION: MECHANICAL

Prevacuum Cycle

The Vacamatic Model Sterilizer utilizes a special piping design to achieve high speed, efficient sterilization. Its features are as follows.

During the "purge" at the beginning of the cycle, the air in the chamber is quickly displaced by steam. This is accomplished by simultaneously opening the steam-to-chamber valve (S-2) and the fast exhaust valve (S-3). At the same time, the water supply valve (S-7) and exhaust cooling valve (S-4) are open. Opening these valves accomplishes two purposes: (1) the cooling water is circulated through the heat exchanger (see diagram, Fig. 3-1), cooling the exhaust steam sufficiently to keep the drain temperature below 140° F; (2) simultaneously, the cooling water passing through the water ejector and heat exchanger flows at a rate sufficient to create a suction at the drain, thus increasing the rate of air and steam flow through the chamber. Flow control valve FC-6 is manually adjusted to permit water flow at the optimal rate for the system. Because of flow resistance incorporated into the system design, the chamber pressure will rise to between 5 and 15 psig during this phase of the cycle.

During the "conditioning" phase of the prevacuum cycle, a series of vacuum pressure pulses is created inside the chamber for efficient conditioning of the load. In the vacuum part of the phase, the filtered air valve (S-1) is closed, preventing air from entering the chamber. Steam-to-chamber valve (S-2) is also closed, preventing steam from entering the chamber. Fast exhaust valve (S-3), water supply valve (S-7), and exhaust cooling valve (S-4) remain open. The passage of cooling water through the heat exchanger condenses steam from the exhaust. The passage of cooling water through the ejector and the heat exchanger creates suction at the drain and produces a vacuum in the chamber.

During the pressure part of the conditioning phase, the water supply (S-7), exhaust cooling (S-4), and fast exhaust (S-3) valves are closed. Since the filtered air valve (S-1) remains closed, the chamber is effectively sealed. The steam-to-chamber valve (S-2) opens, and steam is forced into the chamber to the desired pressure. The number of such vacuum/pressure pulses is determined by the microcomputer controls: see paragraph 3.5.

In the sterilize phase of the cycle, the chamber is again sealed, as described above in the pressure part of the conditioning phase. Steam-to-chamber valve S-2 is thermostatically controlled by temperature switch TS-2 to maintain correct temperature/pressure in the chamber.

The exhaust phase of the cycle is initiated by closing steam-to-chamber (S-2) and filtered air (S-1) valves, and opening fast exhaust (S-3), vacuum water (S-7), and exhaust cooling (S-4) valves. The combined effect of cooling water through the ejector is a suction at the chamber drain, and thus a rapid evacuation of the chamber. The function of the exhaust cooling valve (S-4) is to provide cooling only for the period of peak discharge; therefore, the valve again turns off when chamber pressure is reduced to 2-3 psig.

The dry phase of the cycle again produces a vacuum in the chamber. The vacuum is produced by the combined action of steam condensing in the heat exchanger and the evacuating action of the water ejector.

At the completion of the cycle, all valves are deenergized. All valves, except S-1, filtered air, are normally closed. Thus valve S-1 is the only one open. Filtered air enters the chamber through S-1 to break the vacuum.

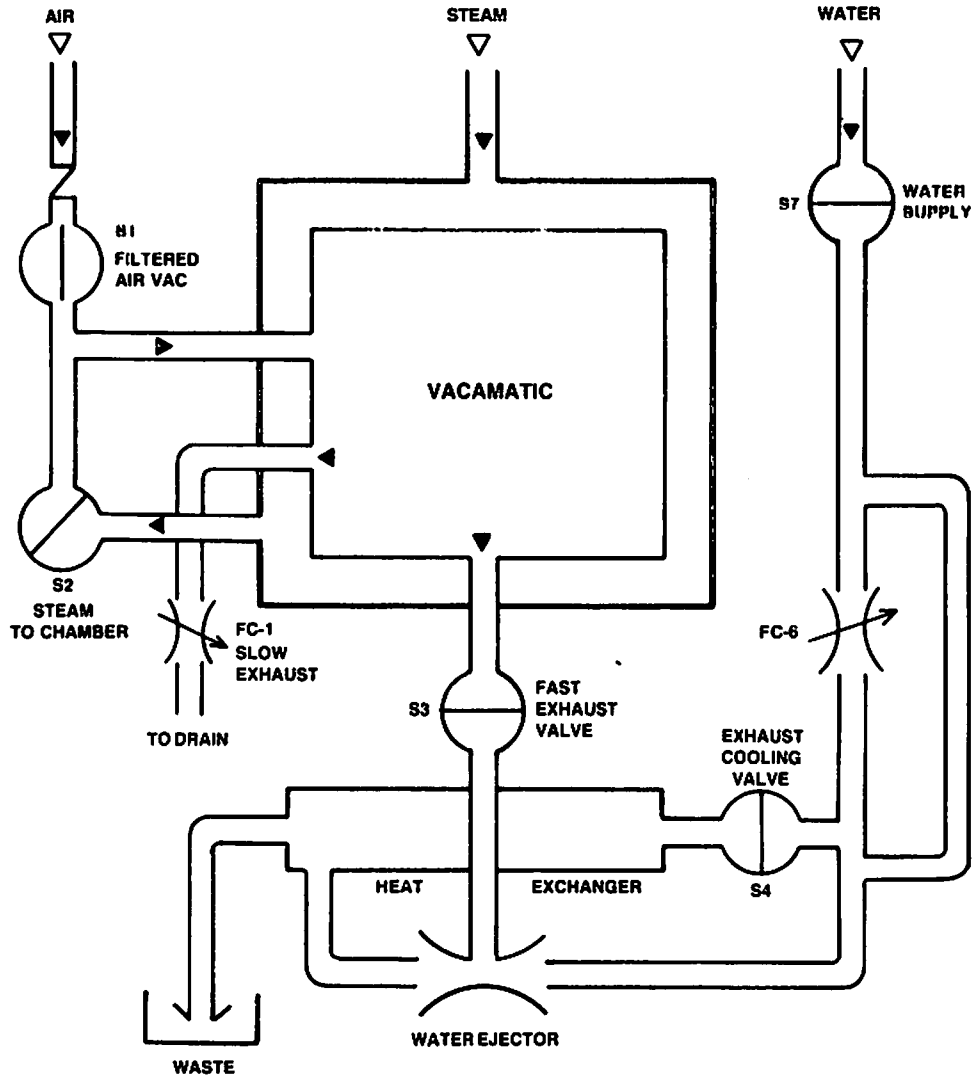


Figure 3-1. PIPING DIAGRAM: VACAMATIC STERILIZER.

Gravity Cycle

In the Gravity cycle of the Prevacuum sterilizer, air is removed from the sterilizer chamber and its load by displacing it with steam. The greater density of the steam gradually forces the air downward and out of the chamber.

During the "purge" at the beginning of the cycle, the air in the chamber is quickly displaced by steam. This is accomplished by simultaneously opening the steam-to-chamber valve (S-2) and the fast exhaust valve (S-3) At the same time, the water supply valve (S-7) and exhaust cooling valve (S-4) are open. Opening these valves accomplishes two purposes: (1) the cooling water is circulated through the heat exchanger (see diagram, Fig. 3-1), cooling the exhaust steam sufficiently to keep the drain temperature below 140° F; (2) simultaneously, the cooling water passing through the water ejector and heat exchanger flows at a rate sufficient to create a suction at the drain, thus increasing the rate of air and steam flow through the chamber. Flow control valve FC-6 is manually adjusted to permit water flow at the optimal rate for the system. Because of flow resistance incorporated into the system design, the chamber pressure will rise to between 5 and 15 psig during this phase of the cycle.

During the "charge" and "sterilize" phases, fast exhaust (S-3), exhaust cooling (S-4), and vacuum water (S-7) valves are closed. The chamber is thus effectively sealed and steam is forced in until desired pressure is reached. Steam-to-chamber valve (S-2) is thermostatically controlled by temperature switches TS-1 and TS-2 to maintain correct temperature/pressure in the chamber.

The exhaust phase of the cycle is initiated by closing steam-to-chamber (S-2) and filtered air (S-1) valves, and opening fast exhaust (S-3), vacuum water (S-7), and exhaust cooling (S-4) valves. The combined effect of cooling water through the ejector is a suction at the chamber drain, and thus a rapid evacuation of the chamber. The function of the exhaust cooling valve (S-4) is to provide cooling only for the period of peak discharge; therefore, the valve again turns off when chamber pressure is reduced to 2-3 psig.

The dry phase of the cycle is initiated by closing the exhaust cooling valve (S-4). All other valves remain as they were during the exhaust phase. The combined effect of the condensation of steam and the suction at the chamber drain is a vacuum in the chamber. A vacuum level of 1-2" Hg is maintained in the chamber.

At the completion of the cycle, all valves are deenergized. All valves, except S-1, filtered air, are normally closed. Thus valve S-1 is the only one open. Filtered air enters the chamber through S-1 to break the vacuum.

Liquids Cycle

The Liquids cycle is identical to the Gravity cycle until the exhaust phase. When the sterilize phase of the cycle is complete, all solenoid valves are deenergized. Slow exhaust of the chamber is accomplished through the slow exhaust line (see diagram, Fig. 3-1), which allows a slow bleed out of the chamber. Slow exhaust rate is controlled by the manually set flow control valve, FC-1.

3.3 CONTROLS

The microcomputer monitors system operations and controls system functions. Input signals are from the control panel's pushbuttons and switches, from the timer settings, and from the system temperature, pressure and vacuum switches. Output signals from the controller are to the panel display lights, to indicate status or warning signals, and to the piping solenoid valves, to operate the sterilizer through the phases of each cycle. The printed circuit boards have LEDs to indicate the presence of an electrical signal to the associated solenoid valve.

Temperature set point is made manually on the indicator-recorder-controller (IRC). Temperature switches within the IRC maintain chamber temperature for the duration of the sterilizing phase. During the cycles, the controller automatically switches on and off the appropriate solenoid valves to maintain correct chamber pressure/temperature. By means of the slow exhaust needle valve, which is open throughout every cycle, there is a constant bleed of steam from the chamber. Depending on which cycle is operating, the controller will automatically select a slow or fast exhaust at the completion of the sterilizing phase. If a drying time is selected for the Gravity or Prevacuum cycles, a vacuum will be pulled in the chamber during that phase. After the drying period, a vacuum switch senses when the chamber pressure is again near normal, and outputs from the controller actuate the COMPLETE signal and sound the buzzer. During the parts of the cycle when steam is being disposed to waste, water to the condenser is automatically turned on to convert the steam to condensate.

3.4 CYCLE DESCRIPTIONS

Preparatory actions: WATER and STEAM valves must be opened manually. HI-LO valve (steam regulator) must be set to HI or LO position. Main power switch and control power switch, both on the secondary panel, must be in the ON position. When power is on, cycle selectors are dimly lit. (**NOTE:** For graphic representations of the cycles and operation of the solenoid valves, see the cycle graphs on pages 6-2, 6-3, and 6-4.)

Liquids Cycle

HI-LO valve **must** be set to LO. Operator selects sterilizing temperature, 250° F (121° C), on indicator-recorder-controller (IRC); then sets STERILIZE time. After loading machine, door(s) must be locked. Panel status light DOOR UNLOCKED goes off (limit switch LS-2 transfers). Operator touches LIQUIDS cycle selector. The cycle light will come on to full brightness.

1. During the condition (or purge) phase of the cycle, both steam-to-chamber solenoid valve (S-2) and fast exhaust (S-3) are open in order to quickly displace the air in the chamber with steam. The following sequence of actions occurs in the machine.

- Panel light CONDITION comes on; also WARNING HOT LIQUIDS light comes on. The following solenoid valves are energized (opened): S-2 (steam-to-chamber), S-3 (fast exhaust), S-4 (exhaust cooling), S-7 (vacuum water). The sixty-second purge timer begins to time. Purge timer times out.

2. After the sixty-second condition phase is completed, the fast exhaust, exhaust cooling, and vacuum water solenoid valves close and the sterilizer begins to build pressure in the chamber. After proper temperature and pressure are reached, the sterilizing phase of the cycle begins. The following sequence of actions occurs in the machine:

- Solenoid valves S-3 (fast exhaust) S-4 (exhaust cooling) and S-7 (vacuum water) close. When sterilizing temperature (250° F) is reached, temperature switch TS-1 (normally open) closes, CONDITION light goes off and STERILIZE light comes on. The STERILIZE timer begins to count down from the pre-set time. When the chamber temperature rises approximately 4 degrees above set point, temperature switch TS-2 (normally open) closes. The signal, processed by the controller, results in closing steam-to-chamber solenoid valve S-2. When the chamber temperature decreases to near set point, TS-2 contacts open, and S-2 (steam-to-chamber) again opens. S-2 and TS-2 cycle in this way for the duration of the sterilizing cycle. Recorded chamber temperature should not vary more than +2° from TS-2 set point.

3. After the sterilize phase is complete, the sterilizer goes into the exhaust phase. The following sequence of actions occurs in the machine:

- Solenoid valve S-2 (steam-to-chamber) closes. STERILIZE light goes out, EXHAUST light comes on. Chamber exhausts slowly through the slow exhaust needle valve. When the chamber has exhausted to 3 psig, pressure switch PS-3 drops out. As soon as this happens, the controller energizes fast exhaust solenoid valve S-3 to quickly empty the chamber of remaining steam.

4. When the chamber is exhausted of steam to 1 psig of pressure, this signals the end of the cycle. The following actions occur at the end of the cycle:

- At 1 psig, pressure switch PS-2 drops out, EXHAUST light goes out, COMPLETE light comes on, HOT LIQUIDS light stays on. Buzzer begins to sound and continues for 90 seconds or until door is opened. When door is opened (only cracked open 1/2" for the first ten minutes following sterilization), buzzer is turned off, DOOR UNLOCKED light turns on, and WARNING HOT LIQUIDS light starts flashing. After 10 minutes, buzzer again sounds and WARNING light stops flashing, but stays on. LIQUIDS cycle light, COMPLETE light, WARNING HOT LIQUIDS light and solenoid valve S-3 (fast exhaust) all stay on until control is reset.

Gravity Cycle

Operator selects sterilizing temperature (usually 250° F [121° C] or 270° F [132° C]) on indicator-recorder-controller, and sets STERILIZE and DRY (if desired) timers. HI-LO valve must be set according to desired temperature. After loading machine, door must be locked. Panel status light DOOR UNLOCKED goes off. Operator touches GRAVITY cycle selector. The cycle light will come on to full brightness.

1. During the condition (or purge) phase of the cycle, both steam-to-chamber solenoid valve (S-2) and fast exhaust solenoid valve (S-3) are open in order to quickly displace the air in the chamber with steam. The following sequence of actions occurs in the machine:

• Panel light CONDITION comes on. The following solenoid valves are energized (opened): S-2 (steam-to-chamber), S-3 (fast exhaust), S-4 (exhaust cooling), S-7 (vacuum water). The sixty-second purge timer begins to time. Purge timer times out.

2. After the sixty-second condition phase is completed, the fast exhaust, exhaust cooling, and vacuum water valves are closed and the sterilizer chamber begins to build pressure. After proper temperature and pressure are reached, the sterilizing phase of the cycle begins. The following sequence of actions occurs in the machine:

• Solenoid valves S-3 (fast exhaust), S-4 (exhaust cooling) and S-7 (vacuum water) close. When sterilizing temperature is reached, temperature switch TS-1 contacts close, and the STERILIZE timer begins to count down from the pre-set time. STERILIZE light comes on, CONDITION light goes out. When the chamber temperature rises approximately 4 degrees above set point, temperature switch TS-2 (normally open) closes. The signal, processed by the controller, results in closing steam-to-chamber solenoid valve S-2. When the chamber temperature decreases again to near set point, TS-2 contacts open, and S-2 again opens. S-2 and TS-2 cycle in this way for the duration of the sterilizing cycle.

3. After the sterilize phase is complete, the sterilizer goes into the exhaust phase. The following sequence of actions occurs in the machine:

If no DRY time was set ...

• Solenoid valves S-1 (filtered air), S-2 (steam-to-chamber) close. Solenoid valves S-3 (fast exhaust), S-4 (exhaust cooling), and S-7 (vacuum water) open. EXHAUST light comes on, STERILIZE light goes off. Chamber is quickly evacuated. When chamber pressure approaches atmospheric, solenoid valves S-4 (exhaust cooling), S-3 (fast exhaust), S-7 (vacuum water) close. S-1 (filtered) air solenoid valve, opens. COMPLETE light comes on, EXHAUST light goes out, and buzzer begins to sound.

If a DRY time was set ...

• Solenoid valves S-1 (filtered air), S-2 (steam-to-chamber) close. Solenoid valves S-3 (fast exhaust), S-4 (exhaust cooling), and S-7 (vacuum water) open. EXHAUST light comes on, STERILIZE light goes off. Chamber is quickly evacuated. When chamber pressure decreases to 3 psig, pressure switch PS-3 drops out. When this happens, the controller starts the DRY timer. Exhaust cooling valve S-4 closes. Chamber pressure during the drying period will be about 26-28" Hg. When DRY timer times out, solenoid valves S-3 (fast exhaust) and S-7 (vacuum water) close, and filtered air valve S-1 opens. When chamber pressure is at least 2 Hg, as sensed by vacuum switch VS-2, COMPLETE light comes on, EXHAUST light goes out, and buzzer begins to sound. Solenoid S-3 (fast exhaust) opens.

4. Buzzer sounds for 90 seconds or until door is opened. When door is opened buzzer stops, COMPLETE light goes out, GRAVITY light goes out, solenoid valve S-3 (fast exhaust) closes, and DOOR UNLOCKED light comes on.

Prevacuum Cycle

HI-LO valve should be set to HI. Operator selects 270° F (132° C) sterilizing temperature on indicator-recorder-controller, and sets STERILIZE and DRY times. After loading machine, door must be locked. Panel status light DOOR UNLOCKED goes off. Operator touches PREVACUUM cycle selector. The cycle light will come on to full brightness.

1. During the condition (or purge) phase of the cycle, both steam-to-chamber solenoid valve (S-2) and fast exhaust valve (S-3) are open in order to quickly displace the air in the chamber with steam. The following sequence of actions occurs in the machine:

• The following solenoid valves are energized (opened): S-2 (steam-to-chamber), S-3 (fast exhaust), S-4 (exhaust cooling), and S-7 (vacuum water). Panel light CONDITION comes on. The sixty-second purge timer begins to time. Purge timer times out.

2. The second phase of the prevacuum cycle consists of a series of three pressure-vacuum pulses. During this part of the conditioning phase, the chamber is alternately pressurized and then de-pressurized until a vacuum is drawn. This type of conditioning assures optimal utilization of the vacuum system for effective conditioning of loads which are appropriate for this method of sterilization. The following sequence of actions occurs in the machine:

• Solenoid valves S-1 (filtered air), S-2 (steam-to-chamber) and S-4 (exhaust cooling) close, and 1-minute vacuum timer begins timing. A vacuum is produced in the chamber. When vacuum switch VS-1 senses 10" Hg vacuum in the chamber, and vacuum timer times out, steam-to-chamber valve (S-2) opens

again to admit steam to the chamber to begin re-pressurizing. Simultaneously, solenoid valves S-3 (fast exhaust) and S-7 (vacuum water) close. Chamber is pressurized to 26 psig, as sensed by pressure switch PS-1, and then S-2 again closes, and valves S-3 (fast exhaust), S-4 (exhaust cooling) and S-7 (vacuum water) open to begin evacuating the chamber until a vacuum is again produced. The entire sequence is repeated until three pressure pulses and four evacuations have occurred.

3. After the fourth evacuation, the chamber is again pressurized and the sterilize phase of the cycle begins.

- S-3 (fast exhaust) closes and S-2 (steam-to-chamber) opens in order to build pressure in the chamber. When sterilizing temperature is reached, as sensed by temperature switch TS-1, sterilizing timer begins to time. Simultaneously, filtered air valve S-1 opens, and vacuum water valve S-7 closes. STERILIZE light comes on, CONDITION light goes out. When the chamber temperature rises approximately 4° above set point, temperature switch TS-2 (normally open) closes. The signal, processed by the controller, results in closing steam-to-chamber solenoid valve S-2. When the chamber temperature decreases to near set point, TS-2 contacts open, and S-2 (steam-to-chamber) again opens. S-2 (steam-to-chamber) and TS-2 cycle in this way for the duration of the sterilizing cycle. Recorded chamber temperature should not vary more than +2° from TS-2 set point.

4. After the sterilize phase is complete, the sterilizer goes into the exhaust phase. The following sequence of action occurs in the machine:

- Solenoid valves S-1 (filtered air) and S-2 (steam-to-chamber) close. Solenoid valves S-3 (fast exhaust), S-4 (exhaust cooling), and S-7 (vacuum water) open. EXHAUST light comes on, STERILIZE light goes out. Chamber is quickly evacuated. When chamber pressure decreases to 3 psig, pressure switch PS-3 drops out. When this happens, the controller starts the DRY timer. Exhaust cooling valve, S-4, closes. During the drying period a vacuum will be drawn in the chamber. When DRY timer time out, solenoid valves S-3 (fast exhaust) and S-7 (vacuum water) close, and filtered air valve S-1 opens. When pressure is at least 2'' Hg, as sensed by vacuum switch VS-2, COMPLETE light comes on, EXHAUST light goes out, and buzzer begins to sound. Solenoid valve S-3 opens.

5. Buzzer sounds for 90 seconds or until door is opened. When door is opened buzzer stops, COMPLETE light goes out, PREVACUUM light goes out, and DOOR UNLOCKED light comes on. Solenoid valve S-3 (fast exhaust) closes.

Cycle Monitoring and Communications

1. If the sterilizer fails to reach sterilizing temperature within 35 minutes for vacamatic cycle or within 60 minutes for gravity of liquids cycle, the operator will be notified as follows:

- When the internal timer times out, the CONDITION light flashes and the audible alarm sounds intermittently. The sterilizer, however, will continue to attempt to reach temperature. The buzzer will continue to sound until (1) a cycle selector is pressed (silences buzzer and resets 35-minute timer); or (2) temperature is finally reached (cycle continues normally); or (3) RESET button is pressed (cycle is aborted).

2. If the chamber temperature falls 2° F below set point (temperature switch TS-1 contacts open) during a sterilization cycle, the sterilizer will go through the following actions:

- STERILIZE timer (internal) resets to beginning. Panel status light STERILIZE blinks. If chamber temperature again rises to set point (TS-1 contacts close), STERILIZE light continues to blink to indicate normal cycle has been interrupted. Cycle will not continue if set temperature is not re-established.

3. If after a cycle has started, the door lock switch opens the sterilizer will go through the following abort phase:

- DOOR UNLOCKED light comes on and audible alarm sounds intermittently. All solenoid valves will close, and any pressure in the chamber will bleed out through the slow exhaust needle valve. Alarm will continue sounding until RESET button is pushed.

4. If there is a loss of supply power to the sterilizer while a cycle is in progress and then a later restoration of power, the sterilizer will go through the following abort phase:

- When power is restored and CONTROL switch is reset, the audible alarm will sound. All solenoid valves will close, and any pressure in the chamber will bleed out through the slow exhaust needle valve. Alarm will continue sounding until RESET button is pushed.

3.5 FUNCTIONAL DESCRIPTION OF THE EAGLE MICROCOMPUTER CONTROLLER

The Eagle controller is built up from three major modules, a power supply assembly, a mother board assembly, and a printed circuit board set. The printed circuit board set consists of printed circuit boards PCB-146586 and PCB-146588. To better understand the operation of the Eagle control, a functional description of each module and each of the printed circuit boards follows.

Power Supply (Figure 6-7)

The power supply used in the Eagle Series controls provides the control with 3 amps — 5 volts direct current (VDC) and 2 amp — 28 VDC required by the system. This power supply can be shown as eight blocks for the 5-VDC supply (Figure 3-2), and five blocks for the 28 VDC supply (Figure 3-3).

The 5-VDC supply operates as follows: voltage from the full wave rectifier (CR201 and CR202) is filtered by the RC network R201 and C101. This filter circuit supplies the bulk voltage (approximately 14 volts) to the series pass transistor Q101 which drops and regulates the output voltage to the required 5 volts. As the output voltage tries to vary from 5 volts, due to load and line variations, the regulating amplifier A401 senses this change and turns Q101 on or off as required to maintain the output at 5 volts.

If the output voltage rises above 5 volts, to an unsafe point of approximately 6.5 volts, the overvoltage circuit, comprised of 1/2 A403, Z402, R436, R428, R425, R427, R437, R426, and R424, feeds back an output to switch Q405 to turn it on. This transistor provides a gating current to SCR401 through R413. SCR401 switches the control switch (CB-1), on the secondary control panel, to off.

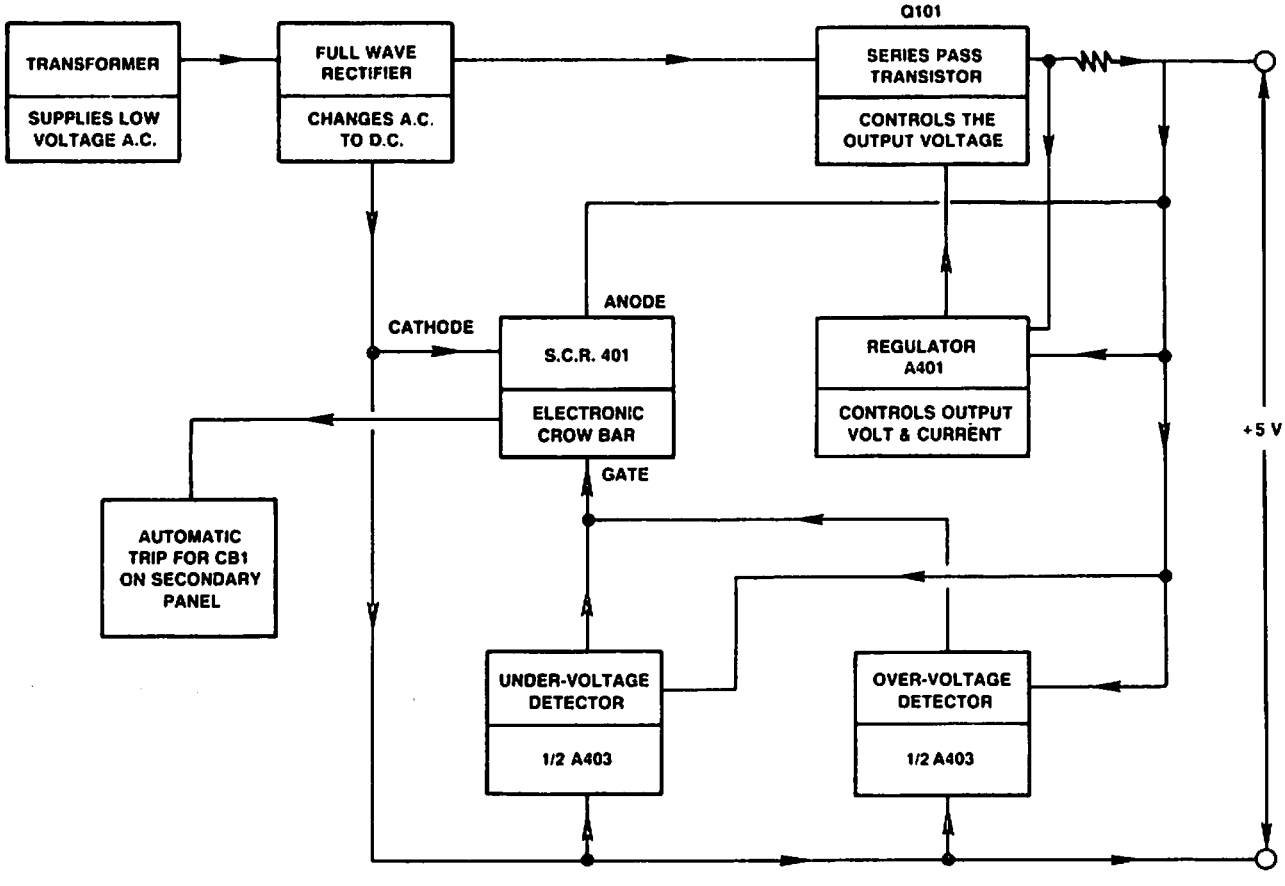


Figure 3-2. EAGLE 5-VOLT POWER SUPPLY.

When the 5-VDC output drops below approximately 4.7 volts, the undervoltage circuit (comprised of 1/2 A403, Z401, C405, R414, R420, R421, R419, R417, R416, R418, C407, R422 and adjustment pot R423) feeds back an output to switch Q406 to turn it on. This transistor provides the current through R412 to gate SCR401. SCR401 switches the control switch (CB-1), on the secondary control panel, to off.

Three adjustable pots are mounted on the printed circuit board and sealed. They are as follows: R430 is a current limit level adjustment. R433 is an output voltage level adjustment, and R423 is the undervoltage setpoint adjustment.

The 28-volt supply is not a regulating supply, but does limit the output to approximately 28 volts. This is done to increase lamp life.

Operation of the 28-volt supply is as follows. Voltage from the full wave rectifier (CR301 and CR302) is filtered by the RC network of R301 and C104. This filtered voltage feeds the output through a time delay "slow-turn-on-circuit" comprised of Q102, Q402, R405, R404, R403, CR403 and C402. The time delay of about 400 milliseconds allows the microcomputer to gain control of the system before the 28 VDC is supplied to the display circuits. The 28 VDC is clipped (limited) at 28 volts by the Z404 zener diode. Thus the 28-volt supply will not be able to exceed approximately 28 VDC.

Mother Board

The mother board assembly contains a large printed circuit board (PCB) that provides the base for the sterilizer connectors (J1, J2, J3, J4) and the interface to these connectors for communications with the rest of the sterilizer. The mother board also contains the connectors (B1, B2, B3), as required, and the interboard interface connections for the plug-in printed circuit boards. Power, from the power supply, is brought into the assembly via J10 and J11 and distributed throughout the assembly by the main PCB.

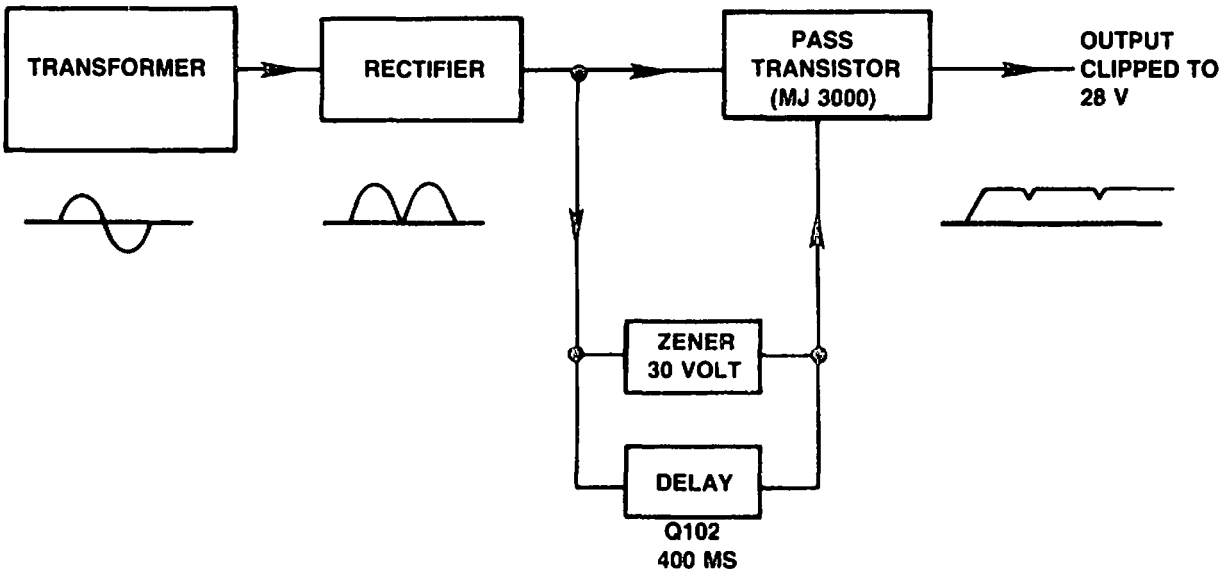


Figure 3-3. EAGLE 28-VOLT POWER SUPPLY.

AMSCO

Eagle™ 2000 SERIES SMALL STERILIZERS

Vacamatic™

• *double door*

TECH DATA

Small Steam Sterilizer (DOUBLE DOOR)

DESCRIPTION

Microcomputer-controlled sterilizer using mechanical air-evacuation for high-speed, high-volume sterilization. Also functions by the gravity air-removal principle. Steam under pressure is the sterilizing agent.

Applications

Prevacuum Cycle — for efficient, high-volume processing of heat- and moisture-stabile materials such as fabrics or wrapped hard goods at 270° to 280° F (132° to138° C).

Gravity Cycles — for sterilizing liquids in flasks with vented closures at 212° to 250° F (100° to 121° C); also for heat- and moisture-stabile goods at 270° to 280° F (132° to138° C).

Chamber Sizes

Interior dimensions are 16x16x26 inches (406x406x660 mm) or 20x20x38 inches (508x508x965 mm), as specified.

Standards

Every sterilizer meets applicable requirements of the following standards:

Underwriters Laboratories, Incorporated, and Canadian Standards Association.

ASME Code, Section VIII, Division 1 for unfired pressure vessels. The pressure vessel is so stamped; ASME Form U-1 or U-3, as applicable, is furnished. Inner shell, including doors, is constructed to withstand working pressure of 36 psig (2.53 kg/cm²).

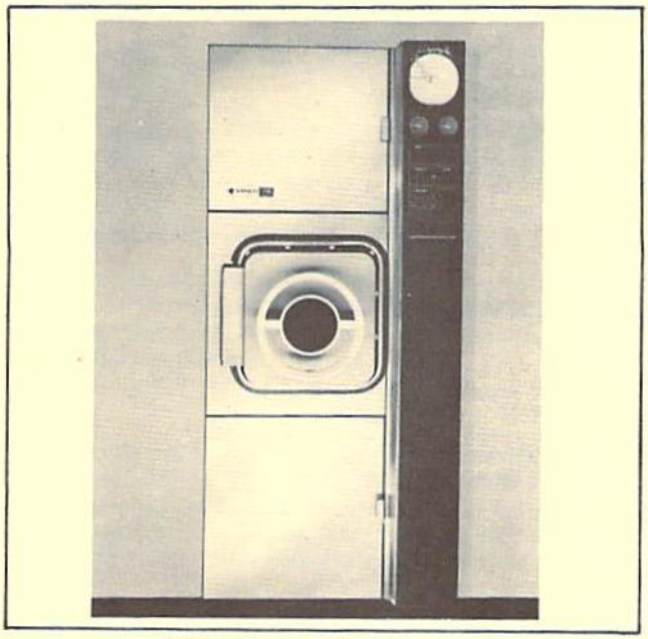
Seismic Stress Calculations — Title 24 (Division T-17 of Part 6) of the California Administrative Code.

ASTM Specification A240 for stainless steel, alloy 302 or 304 if welded, alloy 201, 202, 302 or 304 if not welded.

ASTM Specification B88 for seamless, copper tubing.

ASTM Specification B43 or B135, alloy 1 for seamless, red brass tubing.

ANSI Standard A40.8 for installing sterilizer piping.



Typical only — some details may vary.

THE SELECTIONS CHECKED BELOW APPLY TO THIS EQUIPMENT

Size
- ☐ **Model 2013:** 16x16x26"
- ☐ **Model 2023:** 20x20x38"

Door Hinge (Operating End First)
- ☐ Right Side/Left Side
- ☐ Right Side/Right Side
- ☐ Left Side/Right Side
- ☐ Left Side/Left Side

Mounting
- ☐ For Recessing Through One Wall
- ☐ For Recessing Through Two Walls

Option
- ☐ Manual Control
- ☐ Without Manual Control

Materials Handling Accessories*
- ☐ Rack and Shelves
- ☐ Loading Car and Carriage (20x20x38" Sterilizer Only)
- ☐ Surgical Instrument Trays

**See separate product literature*

Item No. _____

Location(s) _____

_____

_____

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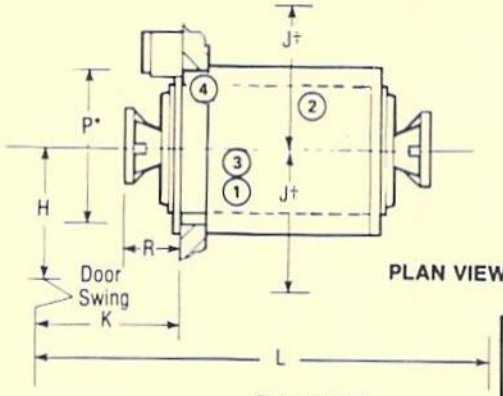
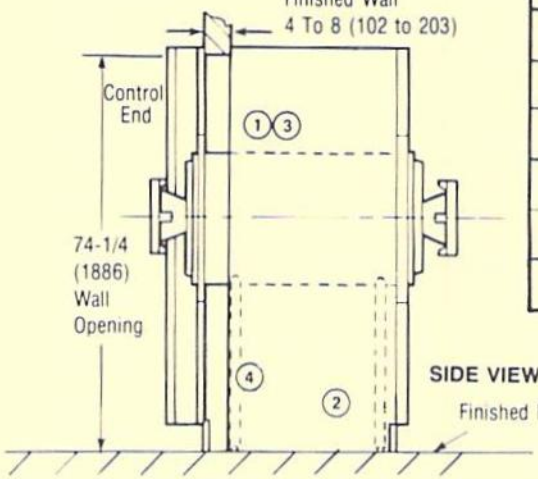
FOR RECESSING THRU ONE PARTITION WALL

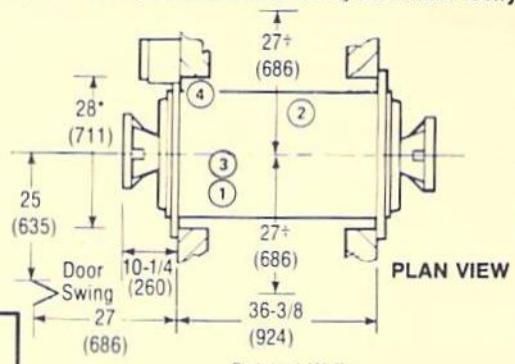


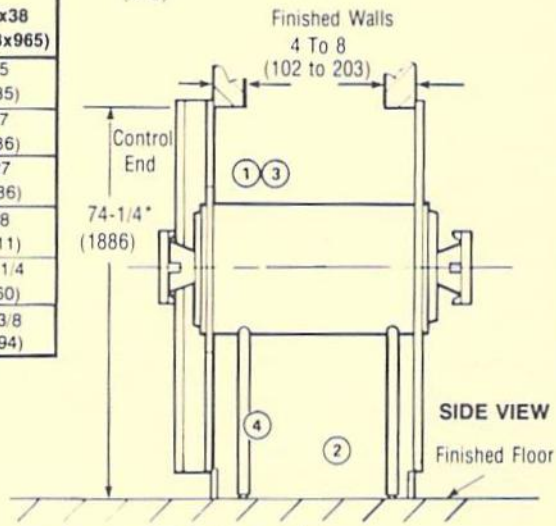


CHAMBER SIZE			
	16x16x26 (406x406x660)		20x20x38 (508x508x965)
H	23 (584)	H	25 (635)
J	25 (635)	J	27 (686)
K	22 (559)	K	27 (686)
P	24 (610)	P	28 (711)
R	10-1/4 (260)	R	10-1/4 (260)
L	80-3/8 (2040)	L	90-3/8 (2294)

†Service Clearance
*Wall Opening

FOR RECESSING THRU TWO PARTITION WALLS (20x20x38 inch [508x508x965 mm] Sterilizer Only)





DIMENSIONS ARE INCHES (MILLIMETRES) — DRAWING IS NOT TO SCALE

OPERATING REQUIREMENTS

(1) COLD WATER — ¾ NPT, 30 to 50 psig (2.11 to 3.52 kg/cm²) dynamic

(2) DRAIN — 1½ ODT

(3) STEAM SUPPLY — ⅜ NPT, 50 to 80 psig (3.52 to 5.62 kg/cm²) dynamic, condensate free, between 97 and 100% saturated vapor

(4) TERMINAL BOX — 120-V, 60-Hz, Single-phase Service

... CHECK LOCAL CODES ...

NOTES

1. Pipe sizes shown indicate terminal outlets. Building service lines to and from the equipment should be increased one pipe size to ensure optimum equipment performance.
2. Disconnect switches (by others) should be installed in electric supply lines near the equipment.
3. Access to the recessing area from the control end of the sterilizer is recommended.
4. Clearances shown are minimal for installing and servicing the equipment.
5. If loading car and carriage are to be used with a 20x20x38" (508x508x965 mm) sterilizer, front clearance should equal twice the length of the sterilizer. This will permit complete withdrawal of the loading car from the chamber and allow convenient maneuverability of the transfer assembly to and from the sterilizer.
6. Right-hand door-swing clearances shown. Clearances for left-hand door swing are identical.
7. Floor drain should be provided within confines of sterilizer framework.

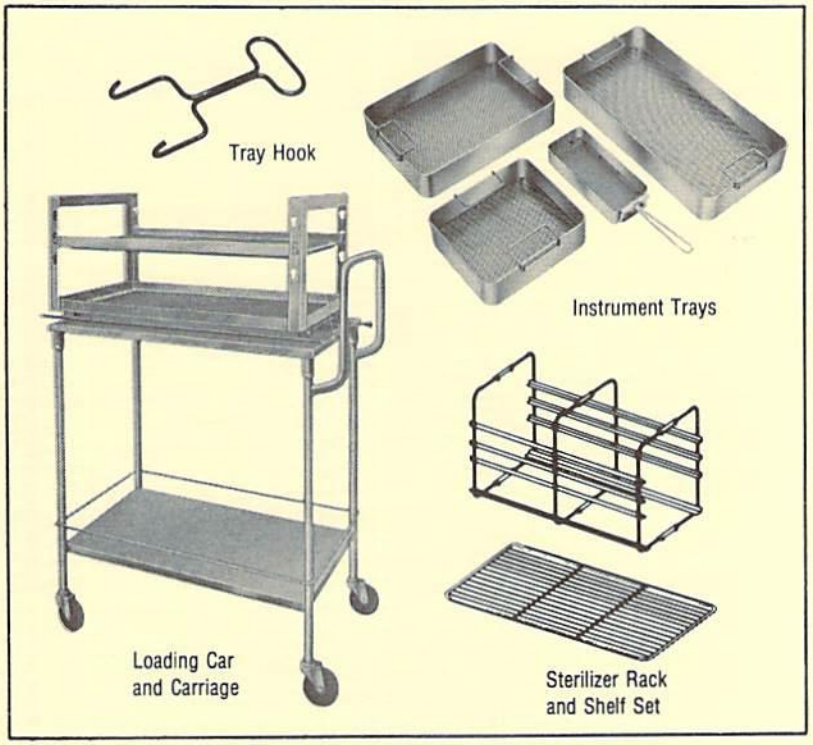
This print is for guidance when planning space and utility services. Actual installation prints may be obtained from any AMSCO office or representative.

AMSCO

Material Handling Accessories

MATERIAL HANDLING ACCESSORIES
• *for small sterilizers and aerators*

TECH DATA



Typical only — some details may vary.

THE SELECTIONS CHECKED BELOW APPLY TO THE EQUIPMENT BEING SPECIFIED.

Sterilizer Size

☐ 16x16x26" (406x406x660 mm)

☐ 20x20x38" (508x508x965 mm)

Accessories

☐ Bottom Shelf

☐ Rack and 2 Shelves

☐ Rack and 3 Shelves

☐ Loading Car
Quantity ____

☐ Carriage
Quantity ____

☐ **Instrument Tray(s)**

Qty:____ 9" (229 mm) Long

____ 15" (381 mm) Long

____ 20-1/2" (521 mm) Long

____ Tray Hooks (Pair)

____ Emergency

____ Extra Handle For Emergency Tray

LOADING CAR AND CARRIAGE

For loading and unloading 20x20x38" (508x508x965 mm) sterilizers or 24x28x38" (610x711x965 mm) aerators, and for transferring goods to and from processing areas.

- **Loading Car.** Welded-Monel framework with two removable shelves of welded-Monel mesh. Upper shelf is adjustable to three heights. Car axles turn on Teflon® bearings impregnated with glass. Wheels are flanged brass. Chamber track assembly has welded-Monel tracks and crossbraces.
- **Carriage.** Welded stainless steel with four swivel casters and neoprene tires. Includes loading car tracks, height-adjustable to align with tracks in sterilizer or aerator chamber.

  Bottom of carriage has a stainless-steel shelf with guard rails. The rails and shelf reinforce the carriage legs.

Item No. _____

Location(s) _____

_____

_____

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over

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Carriage is held to the sterilizer or aerator door frame by a hand-operated latch. Loading car is secured to the carriage by a spring-loaded latch. Latches are operated from the handle-end of the carriage.

SHELF SETS (STERILIZERS ONLY)

Provide loading efficiency for a variety of mixed or single item loads. Shelves are completely removable for processing bulk loads.

- **Rack With Two or Three Full-Length Shelves:** Rack is welded Monel. Angle guides support the shelves. Stops allow each shelf to be withdrawn approximately halfway. Each shelf is welded Monel, suitably reinforced and designed to allow free passage of sterilant.

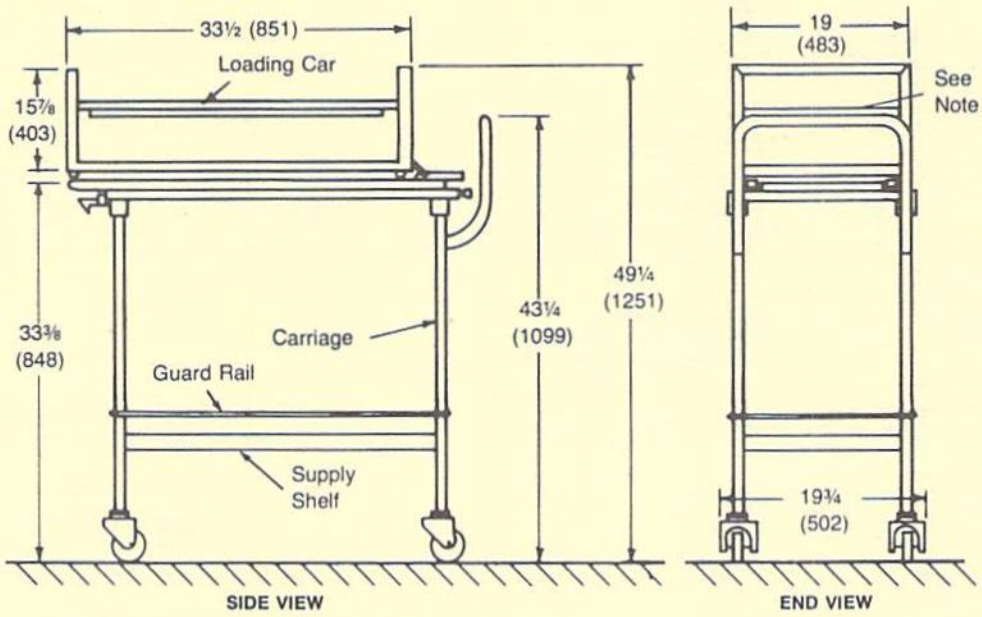
- **Bottom Shelf:** Includes a frame, supports and crossbraces of welded Monel wire rod. Supports keep the rack off the chamber floor.

INSTRUMENT TRAYS

For sterilizing, storing and transporting individual or sets of instruments. Perforated bottoms allow sterilant penetration and prevent trapped air. Bottoms are recessed to reduce wetting of outer wrappers.

- **Surgical Trays:** Welded Monel. Each tray has carrying handles which, when not in use, fold inward parallel to the top of the tray. All trays are 10-1/2" (267 mm) wide x 3" (76 mm) deep. Three lengths are available: 20-1/2" (521 mm), 15" (381 mm), or 9" (229 mm). Optional hooks fasten to tray handles for ease of transporting trays.

- **Emergency Tray:** For sterilizing and transporting "forgotten," dropped, or emergency surgical instruments. Tray is 9-1/2" long x 4" wide x 1-3/4" deep (241x102x44 mm). Stainless-steel construction with a wire-mesh bottom. Furnished with an easily removed, sterilizable handle which can be attached without touching the tray.



DIMENSIONS ARE INCHES (MILLIMETRES) — DRAWING IS NOT TO SCALE

This print is for guidance when planning space and utility services. Actual installation prints may be obtained from any AMSCO office or representative.

CPU Printed Circuit Board — 146586 (Fig. 6-5)

The CPU printed circuit board (PCB) is required for all of the Eagle sterilizers. It contains the microcomputer, A1, support circuits, input buffers and drivers, output buffers and drivers, and the data bus required to communicate with the other two boards. Figure 3-4 is a diagram of the CPU printed circuit board.

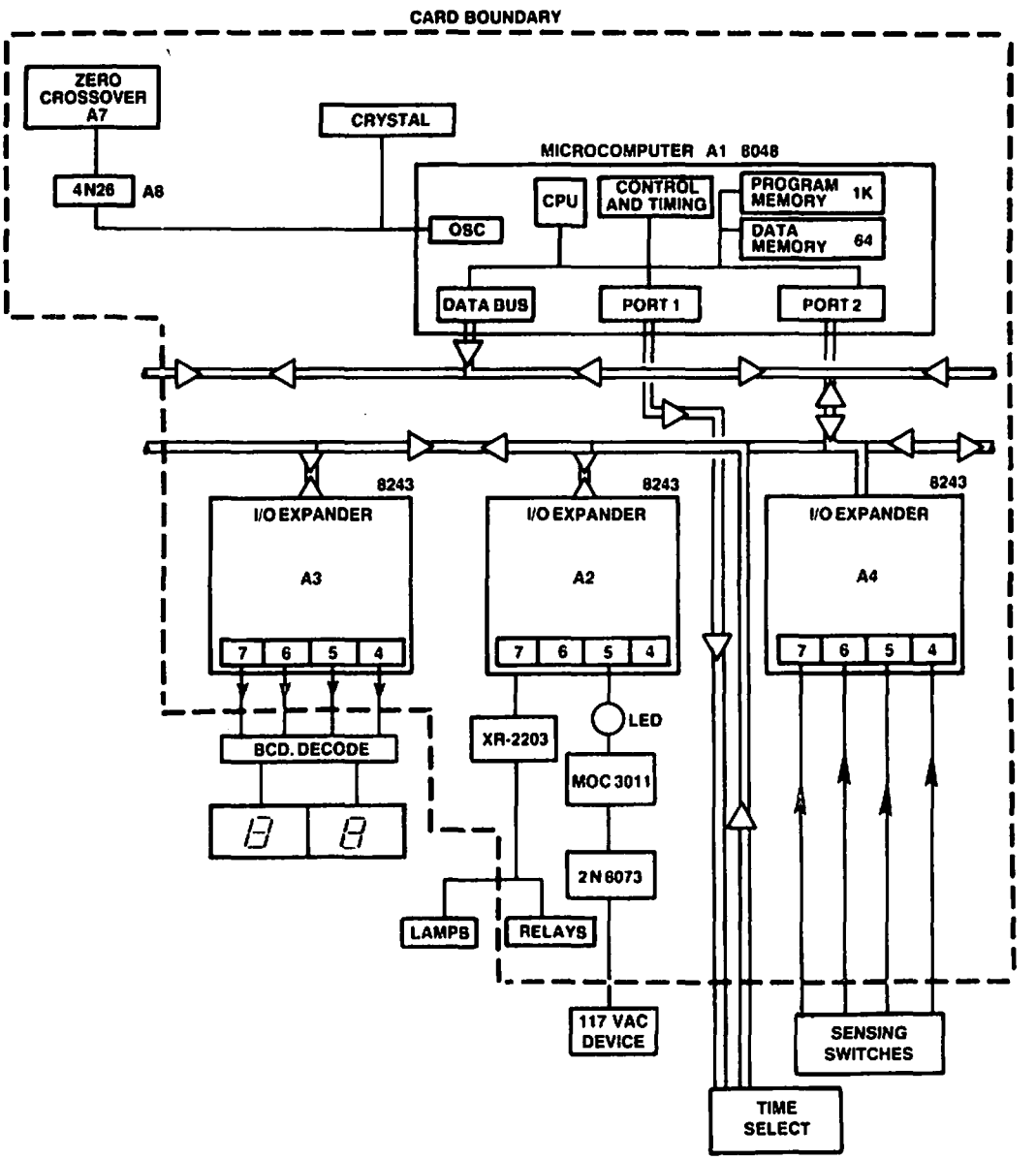


Figure 3-4. CPU PRINTED CIRCUIT BOARD 146586.

The 8048 microcomputer is the heart of the Eagle control system. The system is made to march to the beat of the 8048 oscillator or clock pulse generator (crystal controlled at 3 MHz). The program (sequence of steps to be carried out on all Eagle machines) is contained, in part, in the 1K program memory of the 8048. This program is executed by the control and timing circuits of the 8048 microcomputer. While the program is running, the CPU in the microcomputer will make logical decisions based upon the input information that it receives from the data bus, port 1 or port 2.

Actions to be carried out by an Eagle sterilizer originate in the microcomputer. These actions or signals are sent to the data bus, port 1 or port 2. Hence, as one can see, information can either enter or leave the ports and data bus under the precision guidance of the control and timing of the microcomputer. The computer also contains a data memory capable of storing 64 bytes of information. It is referred to as a RAM. It is a volatile memory which can be written into or read out. The RAM is used to store changeable data, i.e., timer inputs.

There are many elements to control and sense in an Eagle sterilizer. The number exceeds the capability of the microcomputer alone; therefore, additional electronic components must be added to expand the following:

(1) Program memory.
(2) Data memory.
(3) Input/output capacity of the 8048.

Input/Output (I/O) capacity is expanded by the use of an 8243. The I/O expanders only pass or accept signals when the microcomputer calls their attention; that is, enables them. On board one (1) there are three such 8243's, A2, A3 and A4.

A3 is used to pass the appropriate signals to a digital display (output) of the elapsed time (sterilize or dry) during the phases of a cycle.

A2 operates in a similar fashion as A3. Its output signals drive Darlington pairs (XR2203) capable of passing 600 ma of current which are used to turn on the various incandescent lamps required by the sterilizer. A2 also drives, via an LED, triac drivers (MOC3011). The drivers provide proper signals to turn on triacs which in turn operate AC loads (120 VAC) such as solenoid valves. The optical coupling found in these drivers also serves to isolate the 120 VAC power circuits from the low voltage logic circuits.

A4 is used as an input device for the various sensing switches in the system.

Desired sterilize and dry times are set up by the use of thumbwheel switches which, upon request, provide input data to the microcomputer via ports 1 and 2.

The supporting circuits are an external crystal and a zero cross-over network. The crystal, C1 and C2, determines the frequency of the control's operation. This crystal is also the time base for the sterilizer timers. The zero cross-over network (ZCN) consists of A7, C4, R4, 48, C5, R5, and R6. The ZCN prevents the computer from actuating a 120 VAC device during peak voltage of the sine wave. The ZCN monitors the 120 VAC and when the voltage level is of the zero voltage points of the sine wave, it enables the computer output. The ZCN's function is to reduce live transients from being generated which might interfere with the computer operation. These transients might generate false signals should they occur. Another supporting circuit consists of Q9, C13, and R29. This circuit delays the activation of the triac outputs until the computer has gained control. It serves the same function as the delay circuit in the 28 volt power supply.

I/O #1 Printed Circuit Board — 146588 (Fig. 6-7)

The Eagle control system is provided with further expansion capabilities by the addition of the I/O #1 PCB. It expands the data memory (RAM) by 256 bytes and the input/output capacity by 16 with the addition of an 8155 (A1). The microcomputer can pull from an additional 2,000 program instructions from the 8355 (A2) which increases the program capability. Figure 3-5 is a functional diagram of this PCB. The 8355 (A2) also increases the number of input/output channels by 16.

SW1 and SW2 provide a means of setting conditioning and exhausting pulses. Setting of these switches is covered in other sections of this manual.

The input and output drivers function the same as those on the CPU Board.

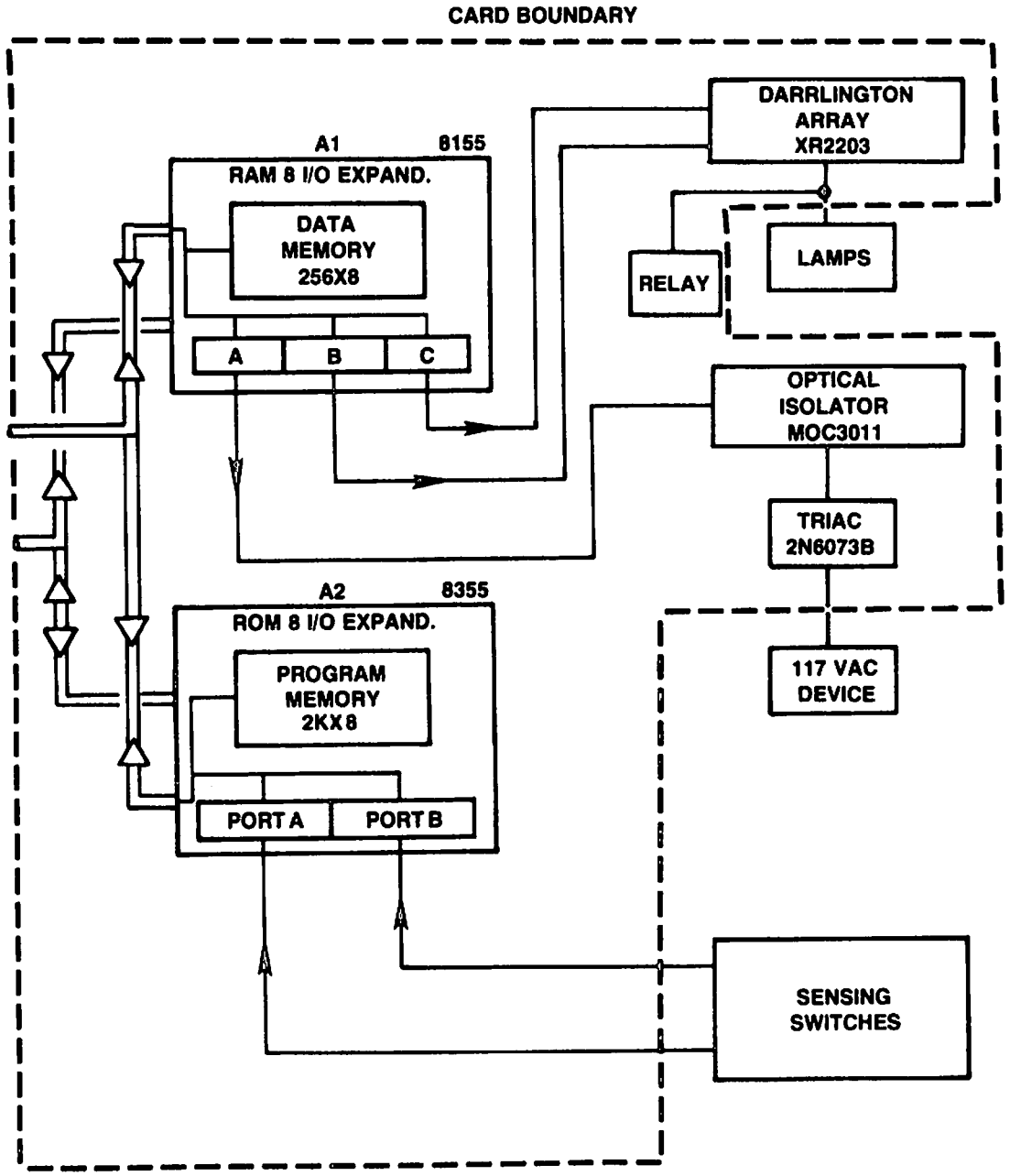


Figure 3-5. I/O #1 PRINTED CIRCUIT BOARD 146588.

SECTION 4

INSPECTION AND MAINTENANCE

4.1 GENERAL

Maintenance procedures described in Sections 4.2 through 4.4 should be performed at regular intervals, as indicated. The frequency indicated is the minimum, and should be increased if usage of the sterilizer demands. Should a problem occur, refer to Section 6, TROUBLESHOOTING. Figure 4-1, p.4-2 to4-4, is a sample maintenance record which we suggest the Maintenance Department keep. Such a record will prove helpful in assuring regular maintenance.

WARNING: BE SURE TO PRESS THE POWER AND CONTROL SWITCHES TO OFF AND WAIT UNTIL CHAMBER COOLS TO ROOM TEMPERATURE BEFORE STARTING ANY MAINTENANCE OPERATIONS.

4.2 ROUTINE INSPECTION

1. Inspect cabinetry for signs of damage or misaligned parts.

2. Check the control panel gauges and recorder for cracked or broken glass, or other obvious damage.

3. Open lower access door and check chamber piping for loose fittings or other obvious defects.

4. With manual steam and water valves open, check lines and valves for leaks.

5. Clean lint and dirt from control system components.

4.3 PREVENTIVE MAINTENANCE

Daily

1. Check recorder chart for inked record after each cycle. Refer to paragraph 7.2 if recorder is not operating properly.

2. Check the door gasket. Replace it if it has become deformed, brittle, or cracked. See paragraph 7.3.

3. Check that pressure regulator (HI-LO valve) is controlling pressure within acceptable ranges. If it appears to be malfunctioning, see paragraph 7.15.

Weekly

1. Watch the sterilizer as it goes through each phase of a complete cycle and check that all indicating lights are working. If a lamp needs replacement, refer to paragraph 7.12.

2. Flush chamber drain line as follows:

a. Remove chamber drain screen (Fig. 8-25, 2).

b. Rinse drain with hot solution of trisodium phosphate (two tablespoons to one quart of water). If the use of trisodium phosphate is objectionable, use instead a solution of 1/2 cup of AMSCO Sonic Detergent (Part P-41591-091) and one quart of hot water.

c. Wait five minutes.

d. Then flush with one quart of hot water.

e. Place the strainer back in the chamber drain.

Monthly

1. Place a few drops of heavy machine oil (SAE 20 or 30) on door hinge pin. Work oil into hinge by opening and closing the door several times.

Quarterly

1. See Figure 4-3. Unscrew the button in center of chamber door wheel to expose the door post grease fitting. Inject a high-temperature grease such as Neptune 7* (Mfgr: Ore-Lube Corp., College Point, N.Y. 11356) or one of equivalent quality into the fitting ... replace button.

Also available from your local AMSCO representative ... ask for part P-385220-091.

PREVENTIVE MAINTENANCE RECORD

Department _____

This form to be utilized for preventive maintenance record only and is not to be used as a guide to perform maintenance.

(Circle "X" In Column When Service Is Performed)

	1ST INSPECTION	2ND INSPECTION	3RD INSPECTION	4TH INSPECTION	5TH INSPECTION	6TH INSPECTION
1. Discuss operation with department personnel.	X	X	X	X	X	X
2. Operate through a cycle noting any discrepancies in cycle phase, temperature, vacuum and pressure.	X	X	X	X	X	X
3. Door Assembly:						
A. Inspect for ease of operation, lube bearings, door post, screw box.		X		X		X
B. Inspect door gasket for proper seal.	X	X	X	X	X	X
C. Replace door gasket.			X			
D. Check door alignment with end ring, lightly oil hinge assembly.		X		X		X
E. Inspect door lock operation for positive lock.	X	X	X	X	X	X
F. Disassemble, lube, replace worn parts in lock mechanism.			X			
4. Steam Piping: (Remove side and top panels, if applicable)						
A. Inspect manual valves for freedom of operation and closing. Tighten packing as required.	X	X	X	X	X	X
B. Rebuild manual valves. Include packing, stem, disc, and seat.			X			
C. Inspect strainers, clean as required.		X		X		X
D. Check jacket and chamber trap. Clean as required for proper operation. Rebuild as required.	X	X	X	X	X	X
E. Inspect gauges.	X	X	X	X	X	X
F. Inspect all check valves for seal and freedom of movement.	X		X		X	
G. Verify operation of solenoid valves S2 and S3. Inspect for leakage.	X	X	X	X	X	X
H. Rebuild solenoid valves. S2 and S3.			X			
I. Check operation of slow exhaust valve. Adjust as required.		X		X		X
J. Inspect operation of HI-LO valve.	X		X		X	

EQUIPMENT EAGLE 1616 — 2020 VACAMATIC Serial No. _____

SAMPLE

Figure 4-1. SAMPLE PREVENTIVE MAINTENANCE RECORD (Sheet 1 of 3).

PREVENTIVE MAINTENANCE RECORD

Department _____

This form to be utilized for preventive maintenance record only and is not to be used as a guide to perform maintenance.

(Circle "X" In Column When Service Is Performed)

	1ST INSPECTION	2ND INSPECTION	3RD INSPECTION	4TH INSPECTION	5TH INSPECTION	6TH INSPECTION
5. Water Supply and Exhaust:						
A. Inspect vacuum breaker for leaks. Clean and/or replace disc and float as required.		X		X		X
B. Inspect manual valves for freedom of operation and closing. Tighten packing as required.	X	X	X	X	X	X
C. Rebuild manual valves, include packing, stem, seat and disc.			X			
D. Inspect strainers for leaks, clean as required.		X		X		X
E. Open flow control valves, flush and reset.	X		X		X	
F. Verify operation of water solenoids S4 and S7. Inspect for leakage.	X	X	X	X	X	X
G. Rebuild solenoid valves. S4 and S7.			X			
H. Check valves — inspect and clean.	X		X		X	
6. Control System:						
A. Clean lint and dirt from components.	X	X	X	X	X	X
B. Inspect recorder linkage, check switches, recalibrate as required.	X	X	X	X	X	X
C. Check inking system for proper indication.	X	X	X	X	X	X
D. Check operation of pressure and vacuum switches, reset as required.	X	X	X	X	X	X
E. Inspect all wiring, terminals, socket connections for damage or fray.		X		X		X
F. Check all LEDs on control board for indication of solenoid signal.	X	X	X	X	X	X
7. Miscellaneous Components:						
A. Inspect air filter for sufficient air flow.	X	X	X	X	X	X
B. Replace filter element.			X			
C. Lift safety valve lever, check for freeness of lift and proper seal.	X	X	X	X	X	X

EQUIPMENT EAGLE 1616 — 2020 VACAMATIC Serial No. _____

SAMPLE

Figure 4-1. SAMPLE PREVENTIVE MAINTENANCE RECORD (Sheet 2 of 3).

PREVENTIVE MAINTENANCE RECORD

Department _____

This form to be utilized for preventive maintenance record only and is not to be used as a guide to perform maintenance.

(Circle "X" In Column When Service Is Performed)

	1ST INSPECTION	2ND INSPECTION	3RD INSPECTION	4TH INSPECTION	5TH INSPECTION	6TH INSPECTION
D. Verify operation of solenoid S-1. (N.O.) Inspect for leaks.		X		X		X
E. Rebuild solenoid valve. S-1			X			
8. Final Check:						
A. Perform a chamber vacuum leak test utilizing absolute gauge.	X	X	X	X	X	X
B. Run test cycles verifying temperature, utilizing potentiometer.	X	X	X	X	X	X
C. Replace any covers removed.	X	X	X	X	X	X
D. Police work area to assure removal of all materials used during inspection.	X	X	X	X	X	X

SAMPLE

INSPECTOR: Sign For Each Inspection and Fill In Date:

_____	*Date*	_____					
_____	*Date*	_____					
_____	*Date*	_____					
_____	*Date*	_____					
_____	*Date*	_____					
_____	*Date*	_____					

EQUIPMENT EAGLE 1616 — 2020 VACAMATIC Serial No. _____

Figure 4-1. SAMPLE PREVENTIVE MAINTENANCE RECORD (Sheet 3 of 3).

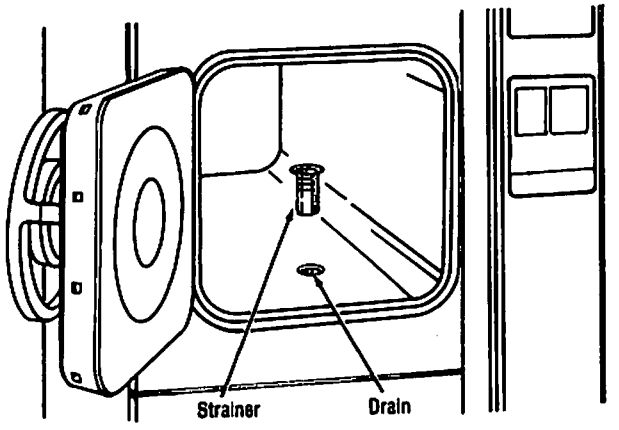


Figure 4-2. LOCATION OF CHAMBER DRAIN STRAINER.

WARNING: BE CAREFUL OF STEAM ESCAPING FROM SAFETY VALVE. TO PREVENT BURNS, WEAR GLOVES OR USE AN EXTENSION DEVICE IF IT BECOMES NECESSARY TO OPERATE THE TRY LEVER.

2. Check chamber safety valve (see Figure 4-4) as follows:

a. Be sure sterilizer is cool.

b. Inspect safety valve for accumulations of rust, scale or other foreign substances which would prevent free operation of the valve. The opening of any discharge piping must be clear and free from restrictions.

c. Operate the try lever several times. The lever should move freely and return to its closed position after each operation.

d. Check safety valve for steam leakage. If valve is leaking, operate the try lever several times to see if the leakage stops.

e. If leakage continues, discontinue operation of sterilizer until a qualified technician replaces the leaky safety valve.

Semiannually

1. Remove cover from air filter (Fig. 8-31, 2) and inspect. Replace if necessary. Replacement may be required more often if sterilizer is in an area with high dust level.

Yearly

1. Open and inspect the thermostatic steam traps. See paragraph 7.6 for disassembly and cleaning instructions.

4.4 CLEANING

Daily

1. Remove chamber drain strainer. Clean out all lint and sediment, then reverse flush strainer under running water.

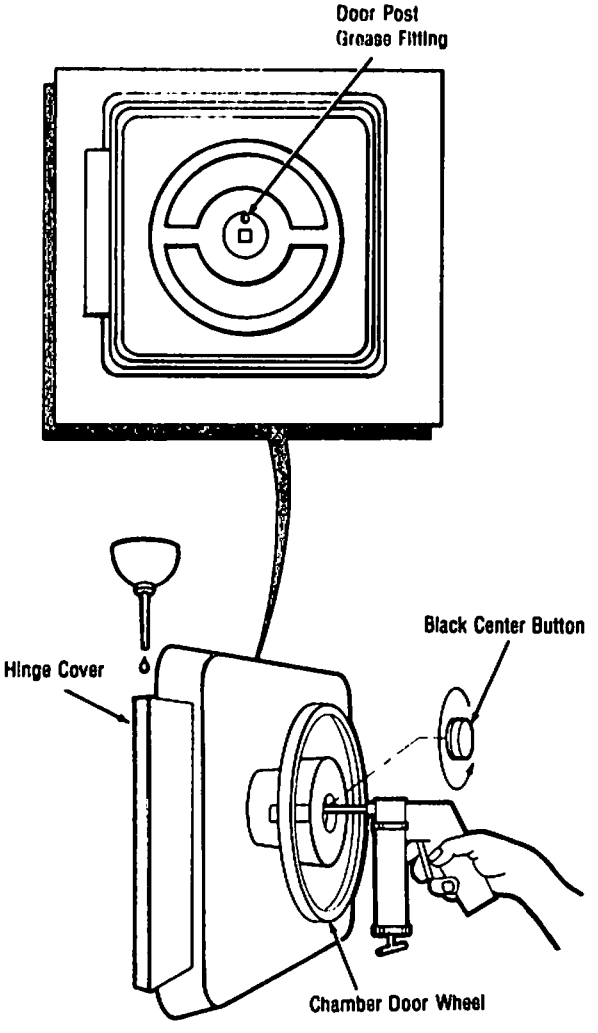


Figure 4-3. LUBRICATING CHAMBER DOOR.

CAUTION: **Never use wire brush or steel wool on door and chamber assembly.**

2. Wash chamber interior and loading equipment with a mild detergent solution such as Calgonite® (Calgon Corporation).

3. Rinse items with tap water and dry with lint-free cloth. Replace strainer.

Monthly

1. Clean gasket sealing surface on chamber door frame(s) with **AMSCO Pry Cream** (included in Door Frame Cleaning Kit, AMSCO Part P-753377-091). Wipe off **Pry Cream** with damp cloth.

2. Clean the door gasket(s) with alcohol or mild detergent. Do not clean with carbon tetrachloride, kerosene, gasoline or other hydrocarbons.

3. Spray sealing surface on door frame(s) with **AMSCO Fluorocarbon Spray** (also included in Door Frame Kit, see above) to prevent gasket(s) from sticking.

4. Open steam and water supply line strainers (Figs. 8-26, 1 and 8-27, 13 respectively) and clean out sediment.

As Necessary

CAUTION: **When using AMSCO Stainless Steel Cleaner and Polish or AMSCO Pry Cleaner, rub in a back-and-forth motion (in the same direction as the surface grain). Do not rub with a rotary or circular motion. Do not use these cleaners on plastic or painted surfaces. Follow directions on containers.**

1. Use **AMSCO Stainless Steel Cleaner and Polish** on all stainless steel exterior surfaces of both the sterilizer and the loading equipment. Apply the cleaner with a damp cloth or sponge, thoroughly wipe off and then polish with a clean, dry cloth. Use **AMSCO Pry Cleaner** to remove stubborn stains.

2. Use a mild detergent such as **AMSCO Sonic Detergent** (P-41591-091) to wash non-stainless-steel surfaces. Rinse with tap water, using a sponge or damp cloth. Wipe dry with a lint-free cloth.

3. Flush chamber drain if drain line becomes clogged or if spillage occurs during liquids processing cycle.

a. Remove the chamber drain strainer.

b. Rinse drain with hot solution of trisodium phosphate (two tablespoons to one quart of tap water).

or

If the use of trisodium phosphate is objectionable, use a solution of 1/2 cup of **AMSCO Sonic Detergent** (P-41591-091) and one quart of hot tap water.

c. Wait five minutes, then flush drain with one quart of hot tap water.

d. Replace chamber drain strainer.

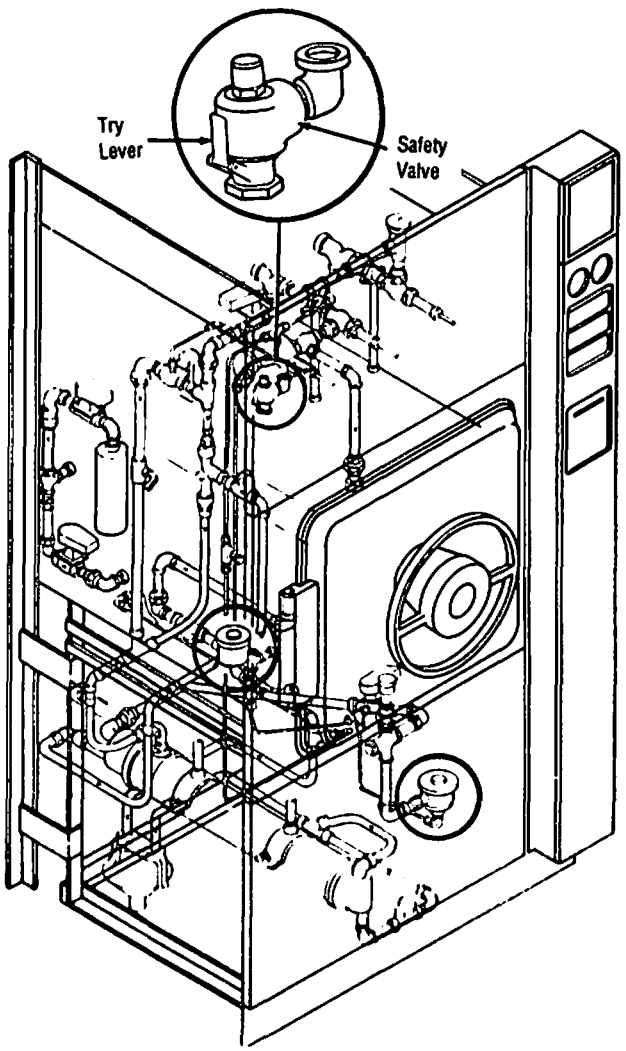


Figure 4-4. LOCATION OF STEAM TRAPS AND SAFETY VALVES.

SECTION 5

SECTION 5

FIELD TEST PROCEDURE

5.1 GENERAL

Every sterilizer must be tested and inspected according to this procedure. Keep a record of the test on the recorder chart. Each test must meet the standards of material, workmanship and performance set forth in this procedure. Potentiometer must be used on each test. Refer to Section 7, should mechanical problems arise or adjustments be required.

Upon completion of test, recorder chart is to be attached to the Service order form.

NOTE: Voltmeter indications referred to in this procedure are approximations. A variance of 0.5 volts is acceptable.

5.2 TEST INSTRUMENTATION REQUIRED

1. Potentiometer and thermocouple leads.

2. Calibrated compound test gauge (30'' vacuum and 100 psig).

3. Calibrated absolute pressure gauge (0-100 mm Hg) with ball valve.

4. Voltmeter or LED test light.

5. Spirit level.

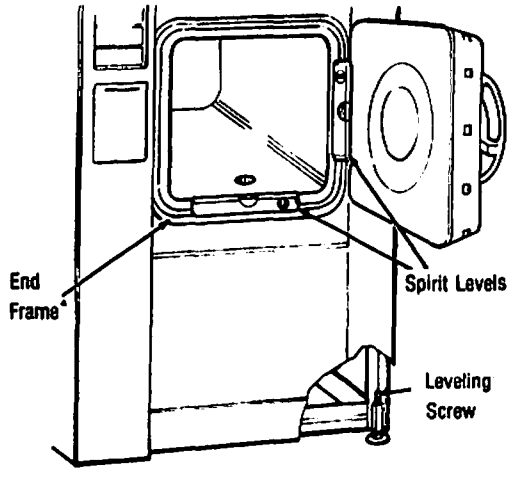


Figure 5-1. LEVELING THE STERILIZER.

5.3 CHECK FOR PROPER INSTALLATION

1. Assure sterilizer shell is level (front to back) by placing a level on the vertical face of the end ring (at the hinge side). Assure sterilizer shell is level (side to side) by placing a level on the horizontal surface of the end ring. Adjust leveling feet accordingly to achieve level conditions. See Figure 5-1.

2. Open door approximately half way. With sterilizer shell level, door will remain in this position. If door swings open or closed, recheck for sterilizer being level.

NOTE: Steam and water supply lines should be one size larger than the nominal pipe sizes on the sterilizer.

3. Check for proper hookup to required services i.e., steam, water, and electrical. See table following.

TABLE 5-1. STERILIZER CONNECTIONS

Plumbing Connections	Nominal at Connection Point Pipe Size	Pressure (Dynamic) Range
Steam Supply	3/8 N.P.T.	50-80 psig
Cold Water	3/4 N.P.T.	30-50 psig
Waste	1-1/2 O.D. Funnel	flow capacity

Electrical Connections			
Volts	**Phase**	**Frequency**	**Amps**
115	1	60 Hz	5

5.4 ADJUSTMENT OF COOLING WATER VALVES AND SLOW EXHAUST VALVE (FIG. 5-2)

	Adjustable Valves	Valve Setting
A	Jacket Trap Cooling FC-2	Two turns open.
B	Chamber Trap Cooling FC-3	Two turns open.
C	Exhaust Cooling FC-6	Approximately 45° from centerline of tube.
D	Slow Exhaust Valve FC-1	Two turns open.

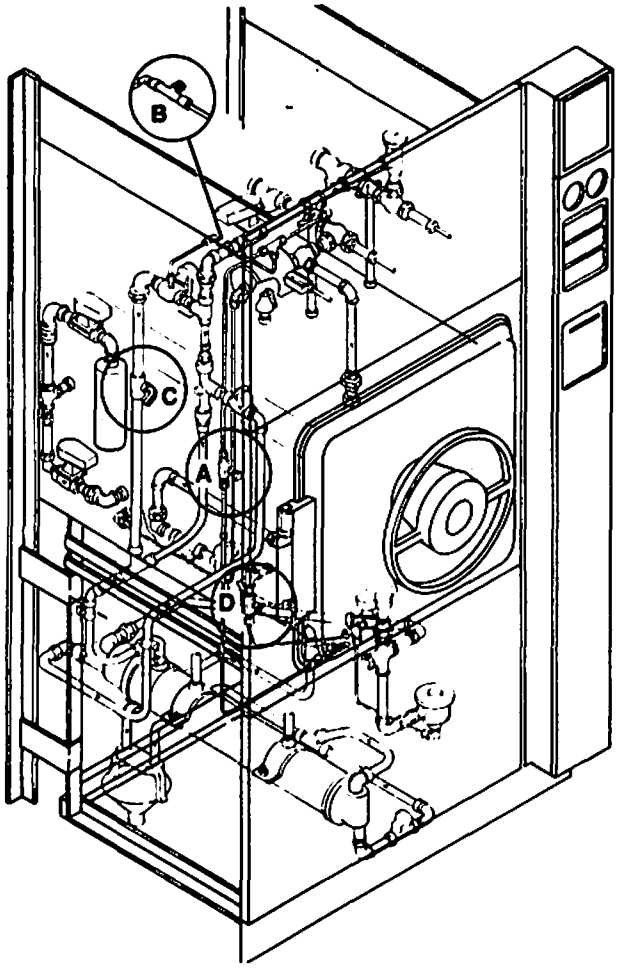


Figure 5-2. ADJUSTMENT OF COOLING WATER VALVES AND SLOW EXHAUST VALVE.

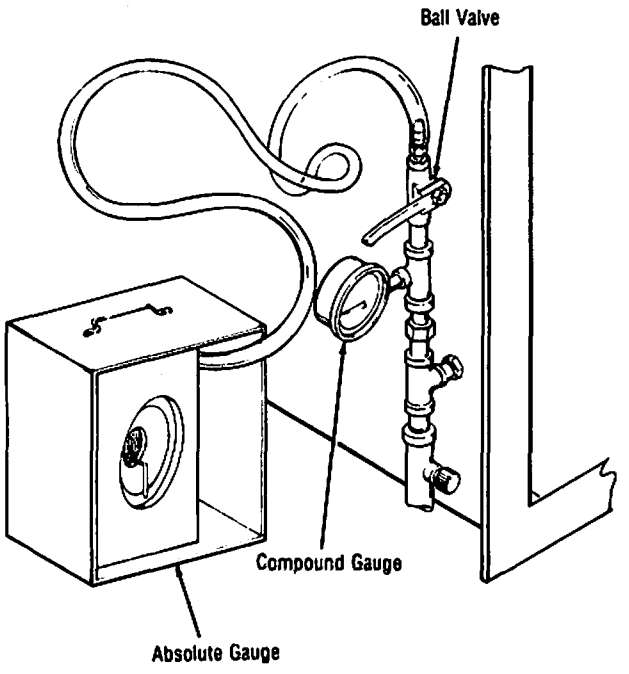


Figure 5-3. GAUGE INSTALLATION.

5.5 INSTALLATION OF POTENTIOMETER LEADS

Install potentiometer leads in chamber drain line through chamber drain screen fitting. The thermocouple junction should be in contact with the recorder bulb. Run leads through the door (between door gasket and sterilizer end ring).

5.6 INSTALLATION OF COMPOUND PRESSURE GAUGE

CAUTION: Do not open ball valve when there is positive pressure in sterilizer.

Install the compound pressure gauge, ball valve and absolute gauge to the opening on right front side of sterilizer shell. See Figure 5-3.

5.7 DOOR SWITCH ADJUSTMENT FOR DOOR WITH NEW GASKET

1. Using a torque wrench on the steam lock clutch rod, close and lock door to approximately 20 ft lbs torque for 16x16 door and 24 ft lbs torque for a 20x20 door. The DOOR UNLOCKED light on primary panel should go out. See Figure 5-4.

2. If DOOR UNLOCKED light fails to go out, use the following procedure to adjust the door switch. See Figure 5-5.

a. Turn microswitch adjusting screw clockwise until switch actuates and DOOR UNLOCKED light on primary panel goes out. Continue to turn microswitch adjusting screw clockwise 1/4 turn.

b. Open door and reclose it to the same amount of torque used in step (1) to verify door switch actuates and DOOR UNLOCKED light goes out.

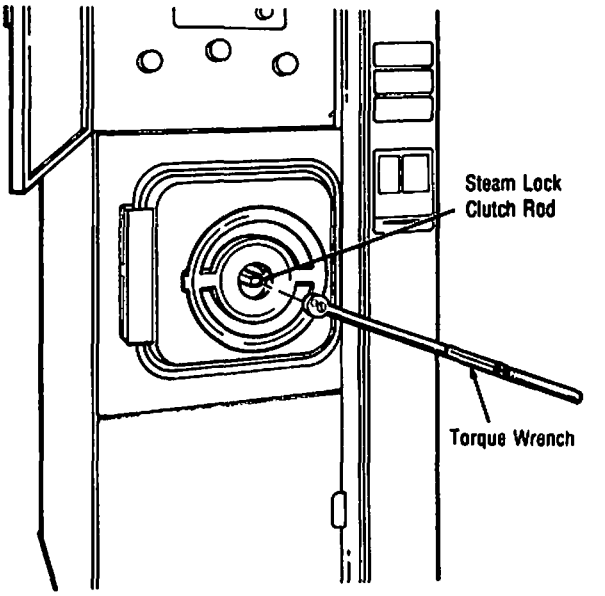


Figure 5-4. LOCKING DOOR TO CORRECT TORQUE.

NOTE: If door switch adjustment procedure is being made on a cold sterilizer, the adjustment must be rechecked after the sterilizer is hot to verify the proper actuation of the door switch.

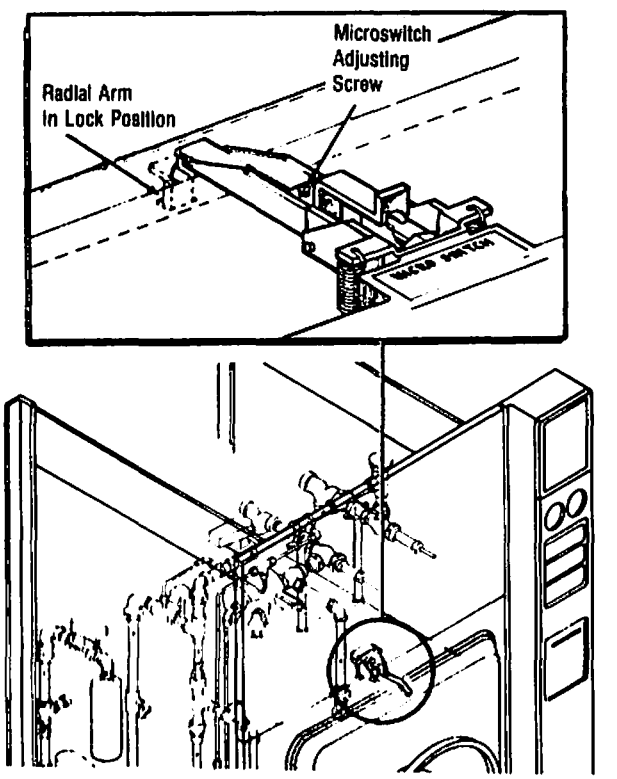


Figure 5-5. DOOR SWITCH ADJUSTMENT.

5.8 SAFETY VALVE TEST (no pressure in jacket)

WARNING: BE CAREFUL OF STEAM ESCAPING FROM SAFETY VALVE. TO PREVENT BURNS, WEAR GLOVES OR USE AN EXTENSION DEVICE WHEN OPERATING THE TRY LEVER.

1. Operate try lever to check for freedom of movement.

2. Visually observe for indications of previous leakage (rust stains and/or scale formations).

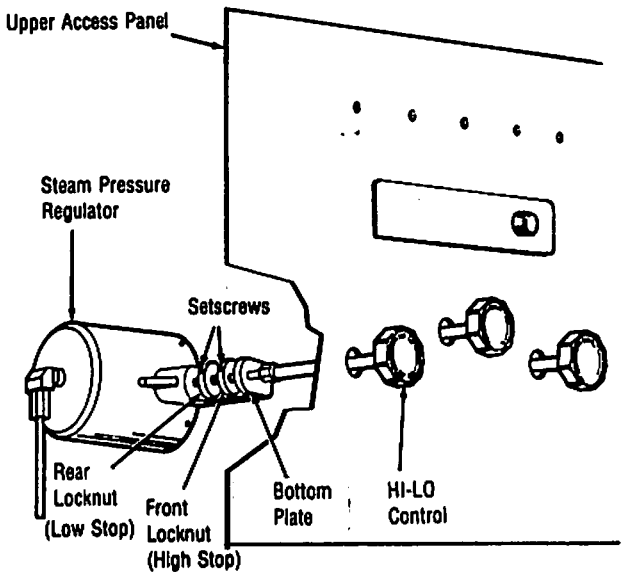


Figure 5-6. ADJUSTING PRESSURE REGULATOR.

9. When cycle advances to slow exhaust, observe the compound pressure gauge to assure proper setting of PS-3 at 3 psig, and PS-2 at 1 psig.

NOTE: Make sure PS-3 and PS-2 function properly before proceeding to the next step.

10. Increase jacket steam pressure to approximately 24 psig.

11. Set orange (top) pointer on recorder to 270° F (132° C).

CAUTION: Because of excessive current draw, do not use an incandescent or neon type test light for the following tests.

5.9 ADJUSTMENT OF PRESSURE AND VACUUM SWITCHES

1. Adjust steam pressure regulator to control jacket pressure at 20 psig. After adjustment is made, lock low stop. See Figure 5-6.

2. Close slow exhaust valve and then open slow exhaust valve 2.5 turns. See Figure 5-2.

3. Close and lock door.

4. Set orange (top) pointer on recorder to 250° F (121° C).

5. Set sterilize time to 1 minute and dry time to 0 minutes. **NOTE:** Refer to cycle graph for liquids cycle.

6. Depress the LIQUIDS cycle button.

7. After the sterilize phase has been completed and control has advanced to slow exhaust, observe calibrated compound pressure gauge. When chamber pressure reaches 3 psig, adjust PS-3 (Figure 5-7) to open the fast exhaust valve (S-3) (LED-12). When chamber exhausts to 1 psig, adjust PS-2 to turn on the COMPLETE light and the buzzer (LED-18).

8. Press reset button on control panel and initiate another LIQUIDS cycle as in step 6.

12. Set sterilize time to 1 minute and dry time to 3 minutes.

13. Hook a digital voltmeter set to 5 volts D.C. or an LED test light across VS-1. (Common to normally open.) With no vacuum in the chamber, meter should read 0 volts. After 10'' vacuum is reached, meter should read 5 volts DC.

14. Depress the PREVACUUM cycle button.

15. Following a steam purge (solenoids S-4 exhaust cooling [LED-16], S-7 vacuum water [LED-14], S-2 steam-to-chamber [LED-13], S-3 fast exhaust [LED-12], on and CONDITION light on), a vacuum will be drawn in the chamber (solenoids S-1 filtered air [LED-15], S-7 vacuum water [LED-14], S-3 fast exhaust [LED-12], on and CONDITION light on.) Adjust VS-1 to actuate at 10'' of vacuum. (Voltmeter goes from 0 volts to 5 volts.)

16. The cycle will proceed to a steam pulse phase (solenoid S-1 filtered air [LED-15], S-2 steam-to-chamber [LED-13], on and CONDITION light on). Allow chamber pressure to rise to 26 psig by adjusting the steam pressure slowly upward.

17. When the chamber pressure has stabilized at 26 psig, adjust PS-1 to advance the control to the second vacuum phase.

18. Adjust the steam pressure regulator to 33 psig and set the high stop.

19. Observe the remaining vacuum/pressure pulses to assure settings of VS-1 at 10" vacuum and PS-1 at 28 psig.

20. Refer to the pre-vacuum cycle graph. After three steam pressure pulses and four vacuums, the control will advance to the sterilize phase.

21. During the sterilize phase (solenoid S-2 steam-to-chamber [LED-13] on and STERILIZE light on), observe the control to assure temperature is controlled between 272° F and 276° F. By TS-2 in the recorder, S-2 steam to chamber solenoid [LED-13] will cycle on and off.

22. After the timed sterilize phase, the control will advance to the fast exhaust phase (solenoid S-4 exhaust cooling [LED-16], S-1 filtered air [LED-15], S-7 vacuum water [LED-14], S-3 fast exhaust [LED-12] and EXHAUST light are on.)

23. At 3 psig the control will start the timed dry phase: solenoid S-1 filtered air [LED-15], S-7 vacuum water [LED-14], S-3 fast exhaust [LED-12] are on and EXHAUST light is on.

24. At the end of the timed dry phase, the vacuum in the chamber will break. No solenoids will be powered. The exhaust light will be on.

25. When the vacuum breaks to 1" of vacuum, adjust VS-2 to bring on the COMPLETE light, the buzzer (LED-18) and the counter (LED-17).

26. Opening the door will reset the control and bring on the DOOR UNLOCKED light.

5.10 CHAMBER VACUUM LEAK TEST

1. Close and lock door.

2. Attach a manually operated valve to the air intake in place of the vacuum break filter. Set manual valve fully closed.

3. Set the DRY timer to maximum time setting. Set the STERILIZE timer to 1 minute.

4. Initiate a PREVACUUM cycle, allowing the cycle to progress to the vacuum drying phase.

5. Open the ball valve to the absolute pressure gauge and observe the gauge for the vacuum stall point. Vacuum should reach at least 40 mm absolute. If 40 mm absolute cannot be reached within 15 minutes, examine system for leaks.

6. After vacuum stall point is reached, turn power switch to OFF position.

7. Slowly bleed in air from the manual valve installed in place of air filter until 50 mm absolute pressure is reached. Tightly close valve.

8. Begin timing when chamber pressure reaches 50 mm Hg.

9. Using the absolute pressure gauge, determine the rate of air leakage. The maximum acceptable leak rate is 1 mm per minute over a 5-minute period for a maximum increase of 5 mm pressure starting with 50 mm in the chamber. If these conditions cannot be met, there is a vacuum leak which must be located and remedied.

10. Open manual valve on air filter to relieve chamber vacuum.

11. Remove manual valve and replace vacuum air filter and replace absolute pressure gauge with compound test gauge.

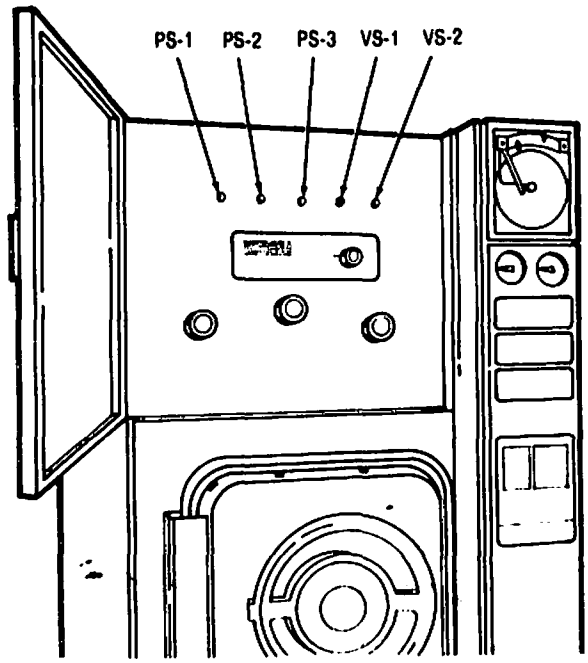


Figure 5-7. ADJUSTMENT OF PRESSURE AND VACUUM SWITCHES.

5.11 OPERATIONAL CHECKS

TABLE 5-2: LIQUIDS CYCLE

This table is to be used as a quick reference in checking the operation of the liquids cycle. Included are times of the various phases of the cycle, and chamber pressures and temperatures.

Initial Setup:

1. Make certain WATER and STEAM supply valves are on.
2. Adjust steam pressure regulator to the stop on the LO setting. Jacket pressure should be controlled at 20 (+ 1) psig.
3. Set yellow pointer on IRC to the 250° F (121° C) mark.
4. Set STERILIZE timer to 5 minutes.
5. Check panel to assure that DOOR UNLOCKED light is on. On double door units, OPPOSITE DOOR UNLOCKED light must also be illuminated when rear door is opened.
6. Close and lock door(s). DOOR UNLOCKED light(s) must be extinguished when door is properly tightened.

NOTE: After cycle has started and has progressed to STERILIZE phase, wait for a minute and then test the operation of the chamber undertemperature monitor by moving the yellow IRC pointer to a position 2° F (1° C) above the temperature indicated by the orange pointer. Sterilize timer should reset to time set on thumbwheel switches and STERILIZE light on the cycle status panel should begin to blink. Return yellow pointer to 250° F (121° C). Timer will start timing again. STERILIZE light will continue to blink.

7. Touch LIQUIDS cycle selector. Only minimal pressure should be required to actuate the switch. Cycle status should illuminate CONDITION. Begin timing.

Phase	Sterilizer Condition	Time		Reference: TROUBLE-SHOOTING CHART, item no:
		16x16	20x20	
Charge Jacket	Jacket must charge to 20 +1, -0 psig			2.H
Condition (Purge) Panel Light: CONDITION	Chamber pressurizes to about 10 psig. Solenoid valves S-2 (D-13)*, S-3 (D-12), S-4 (D-16), S-7 (D-14) open.	1 min.	1 min.	3.A., 3.B., 3.C.
Come-up time Panel Light: CONDITION	Solenoid valve S-3 (D-12), S-4 (D-16), S-7 (D-14) close. Chamber temperature rises to 250° F, pressure to 20 + 1, -0 psig.	4 + 1 min.	5 + 1 min.	3.A., 3.C.
Sterilize Panel Light: STERILIZE	Chamber temperature at 252-256° F, pressure at 20 psig. Solenoid valve S-2 (D-13) cycles to maintain pressure/temperature.	5 min.	5 min.	3.D., 3.E., 3.F., 3.G.,
Slow Exhaust Panel Light: EXHAUST	Solenoid valve S-2 (D-13) closes. Chamber exhausts slowly through slow exhaust valve. At chamber pressure 3 psig, S-3 (D-12) opens for fast exhaust for remaining steam.	5+2-0 min.	6+2-0 min.	5A.
Complete Panel Light: COMPLETE	At 1 psig, buzzer (D-18) sounds for 90 seconds or until door is opened. When door is opened, S-3 closes. WARNING HOT LIQUIDS light comes on and blinks for ten minutes.	90 sec.	90 sec.	6.A., 6.B.

*LED NO. ON CONTROL BOARD

TABLE 5-3: GRAVITY CYCLE

This table is to be used as a quick reference in checking the operation of the gravity cycle. Included are times of the various phases of the cycle, chamber pressures and temperatures.

Initial Setup:

1. Follow steps for "Initial Setup" of Liquids Cycle, except set both STERILIZE and DRY times to 5 minutes.
2. Initiate a GRAVITY cycle.
3. This cycle should be identical to the LIQUIDS cycle until the EXHAUST phase of the cycle is reached.

Phase	Sterilizer Condition	Time		Reference: TROUBLE-SHOOTING CHART, Item no:
		16x16	20x20	
Charge Jacket	Jacket must charge to 20 +1, -0 psig.			2.H
Condition (Purge) Panel Light: CONDITION	Chamber pressurizes to about 10 psig. Solenoid valves S-2 (D-13), S-3 (D-12), S-4 (D-16), S-7 (D-14) open.	1 min.	1 min.	3.A., 3.B., 3.C.
Come-up time Panel Light: CONDITION	Solenoid valve S-3 (D-12), S-4 (D-16), S-7 (D-14) close. Chamber temperature rises to 250° F, pressure to 20 +1, -0 psig.	4 + 1 min.	5 + 1 min.	3.A., 3.C.
Sterilize Panel Light: STERILIZE	Chamber temperature at 252-256° F, pressure at 20 psig. Solenoid valve S-2 (D-13) cycles to maintain pressure/temperature	5 min.	5 min.	3.D., 3.E., 3.F., 3.G.
Fast Exhaust Panel Light: EXHAUST	Solenoid valves S-1 (D-15) and S-2 (D-13) close. Solenoid valves S-3(D-12), S-4 (D-16) and S-7 (D-14) open. Chamber pressure decreases to 3 psig, the DRY timer begins.			4.A., 4.B.
Dry Panel Light: EXHAUST	Solenoid valve S-4 (D-16) closes. Chamber continues exhausting until a vacuum is pulled on the chamber. Vacuum will be about 26-28" Hg.	5 min.	5 min.	4.A., 4.B.
Complete Panel Light: COMPLETE	Solenoid valves S-3 (D-12), S-7 (D-14) close, S-1 (D-15) opens. When Chamber pressure reaches 1 Hg. buzzer (D-18) sounds for 90" seconds or until door is opened.	90 sec.	90 sec.	6.A., 6.B.

TABLE 5-4: PREVACUUM CYCLE

This table is to be used as a quick reference in checking the operation of the prevacuum cycle. Included are times of the various phases of the cycles, chamber pressures and temperatures.

Initial Setup:

1. Turn HI-LO valve to the HI position. Jacket pressure should rise to 33 (+ 1) psig.
2. Position the yellow IRC pointer to 270° F (132° C).
3. Set STERILIZE timer to 4 minutes and DRY timer to 5 minutes.
4. Close and lock door.
5. Touch the PREVACUUM cycle selector button. Minimal pressure should be required to actuate the switch.

Phase	Sterilizer Condition	Time		Reference: TROUBLE-SHOOTING CHART, Item no:
		16x16	20x20	
Charge Jacket	Jacket must charge to 33 ± 1 psig			2.H.
Condition (Purge) Panel Light: CONDITION	Chamber pressurizes to 8-15 psig. Solenoid valves S-2 (D-13)*, S-3 (D-12), S-4 (D-16), S-7 (D-14) open.	1 min.	1 min.	3.A., 3.B., 3.C.
Vacuum/Pressure Pulses Panel Light: CONDITION	Solenoid valves S-1 (D-15), S-2 (D-13) close, chamber pressure is reduced. At 3 psig, S-4 (D-13) closes and a vacuum is drawn in the chamber. After one minute elapses and correct vacuum is is reached (10" Hg), S-2 (D-13) opens, and S-3 (D-12) and S-7 (D-3) close: chamber is repressurized to 26 psig. Second vacuum is then drawn. Check IRC chart to verify a total of four chamber evacuations and three steam pulses, excluding initial pressure rise, for this phase. Phase ends with a vacuum.			3.A., 3.B., 3.C.
Come-up time Panel Light: CONDITION	S-3 (D-12) closes and S-2 (D-13) opens. Chamber pressure increases 28 +2 psig, 270° F	1 min.	1 min.	3.A., 3.C.
Sterilize Panel Light: STERILIZE	Solenoid Valve S-1 (D-15) opens. Chamber at 272°-276° F, pressure at 28-32 psig. S-2 (D-13) cycles to maintain temperature/pressure.	4 min.	4 min.	3.D., 3.E., 3.F., 3.G.,
Fast Exhaust Panel Light: EXHAUST	Solenoid valves S-1 (D-15), S-2 (D-13) close. S-3 (D-12), S-4 (D-16), S-7 (D-14) open. Chamber pressure decreases to 3 psig.	1 min.	1 min.	4.A., 4.B.
Dry Panel Light: EXHAUST	Solenoid valve S-4 (D-16) closes. Chamber continues to be evacuated to 25-28 Hg. DRY timer begins counting down.	5:15 min.	5:15 min.	4.A., 4.B.
Complete Cycle Light: COMPLETE	Solenoid valves S-3 (D-12), S-7 (D-14) close, S-1 (D-15) opens. When chamber pressure reaches 2" Hg, buzzer (D-18) sounds for 90 seconds or until door is opened. Solenoid valve S-3 (D-12) opens until door is opened.	90 sec.	90 sec.	6.A., 6.B.

TABLE 5-5: MANUAL OPERATION

Initial Setup:

1. Set HI-LO valve on LO. Power switch must be off.
2. Manual operating valve must be in OFF position.
3. Open manual steam and water supply valves.
4. Close and lock door(s).
5. Operate manual valve as follows in sequence clockwise rotation:

POSITION	OBSERVATIONS	TIME
Charge Jacket (Grav/Iso ONLY)	Jacket must charge to 20 + 1 psig.	
CONDITION	Solenoid valves S-2, S-3, S-4 and S-7 must open. Purge must take place with approximately 10 psig steam pressure in chamber.	1 minute
STERILIZE	Solenoid valve S-2 opens and chamber must be pressurized to approximately 20 psig.	5 minutes
SLOW EXHAUST	All valves must remain closed and slow exhaust must start. When pressure in the chamber is 4 psig, turn manual valve to next position.	4-7 minutes
FAST EXHAUST	Solenoid valves S-3, S-4, and S-7 MUST OPEN AND FAST EXHAUST MUST COMMENCE. When pressure in the chamber is 1 psig, turn manual valve to DRY POSITION.	1-2 minutes
DRY	Solenoid valves S-3, S-4, and S-7 must open and vacuum must be pulled on the chamber and air must be sucked in through the vacuum break line.	5 minutes
OFF	Cycle completed. Open the door.	1 minute

SECTION 6

TROUBLESHOOTING

This section contains detailed information for locating and correcting the cause of sterilizer malfunctions.

6.1 HELPFUL HINTS

1. Use the operating procedures in Section 2 to verify the trouble symptom. If necessary, use the RESET Button and operate sterilizer more than once in case reported problem is being caused by periodic component malfunction.

2. Use the cycle graphs, Figures 6-1 through 6-3, in order to follow the sterilization cycles through the various phases. The cycle graphs may also be used to check for correct operation of the solenoid valves which control the various phases.

3. Refer to paragraph 6.3 and the TROUBLESHOOTING CHART (Table 6-1) after the symptom has been verified.

4. Use the operational descriptions (Section 3), electrical schematics (Figs. 6-4 through 6-8) as aids in understanding system operation and how the malfunction of a specific component would affect it.

5. Refer to the following guides for example of what to look for and what to do when troubleshooting.

Steam & Water Supplies

a. Be sure the building-supply valves are fully open.

b. Be sure the supply pressure is the proper value and that it does not fluctuate. Be sure that gauge readings are accurate.

c. Be sure the steam supply is of the proper quality and that the steam-supply line is well drained. This will ensure condensate-free steam of between 97 and 100 percent saturated vapor.

d. Check all valves and adjust, repair or replace as necessary.

e. Clean the supply strainers.

f. Check the drain thermostatic traps; replace the elements if necessary.

g. Inspect the entire system; correct all leaks.

Electronic/Electrical System

a. In general, for any electrical malfunction, first measure or observe the input or output voltage signals as an indicator of the failure. This should isolate the malfunction to:

- Input drives: vacuum, pressure, temperature, time settings, reset, cycle select.
- Output devices: solenoids, ball valves, relays, panel lamps, etc.
- System logic circuit boards of the controller.

b. In case of malfunctioning AC outputs, check the status of the light emitting diodes (LEDs), on the edge of the printed circuit board. All AC outputs are controlled by an AC ON/OFF switch (SW101) located on the power supply chassis. If the LED is on and the associated valve is off, the system logic is correct and the malfunction is in the wiring or output device.

c. If the LED is off, then check the input circuitry, i.e., pressure and vacuum switches.

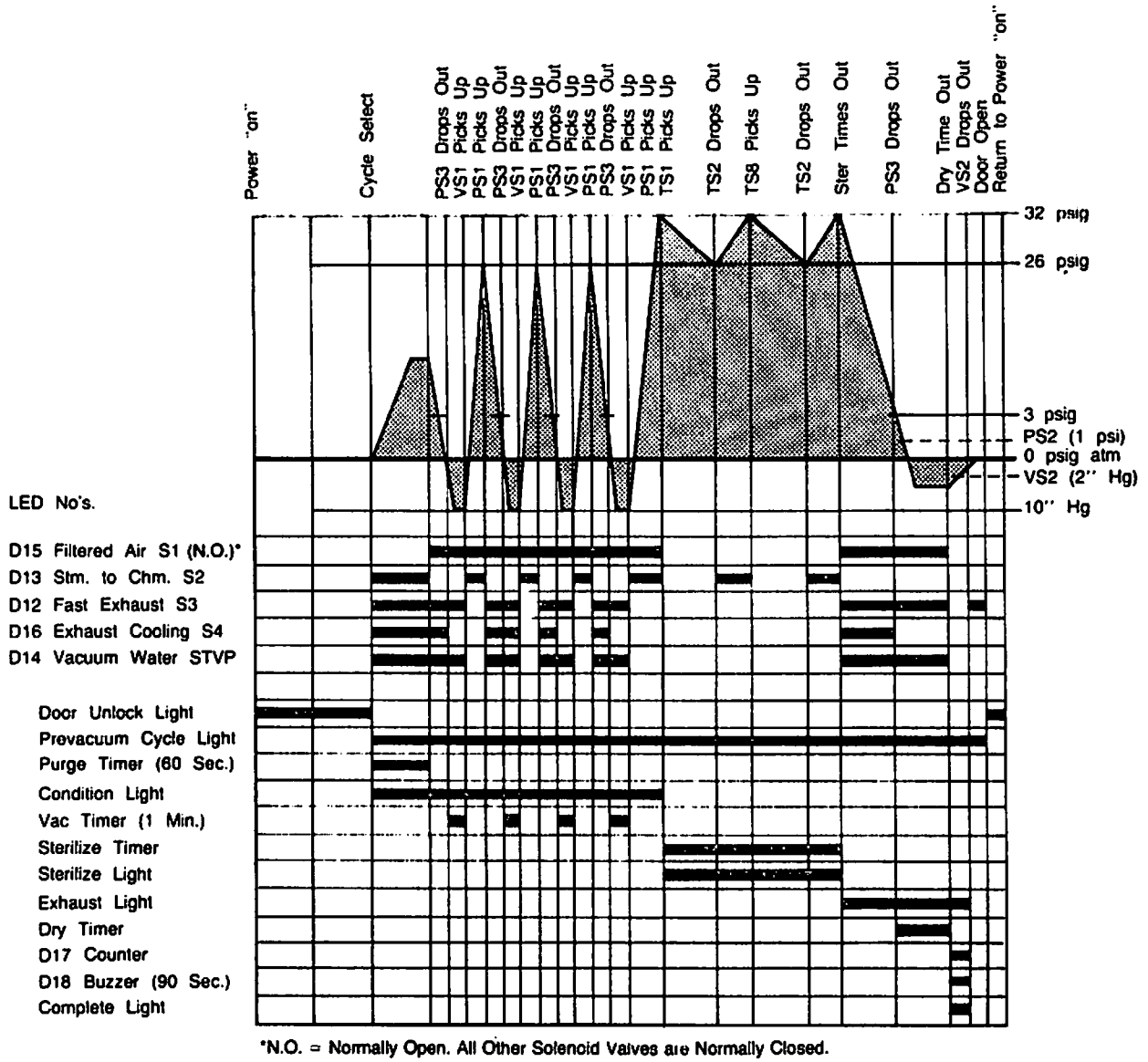
d. All voltages are with respect to AC return and all DC voltages are with respect to DC ground.

e. Check circuit breakers first when supply voltage does not appear.

6.2 HOW TO USE THE CYCLE GRAPHS

The cycle graphs (Figs. 6-1, 6-2 and 6-3) are representations of the operations of the cycles available with the sterilizer. They are intended to be used for two main purposes: (1) as an aid in understanding how the various cycles work; (2) as an aid in troubleshooting. The upper graph on each page is a representation of chamber pressure variation during the separate phases of the cycle. The LEDs (light emitting diodes), located on the printed circuit boards behind the front panel, are identified with the corresponding output device. When a solenoid valve, for example, is actuated (energized), the LED will be on.

As an aid in troubleshooting, the graph should be used to, first, identify the point in the cycle where a malfunction occurs, and, second, to check the operation of the valves which should be opened (energized) or closed (deenergized) during the phase where the problem occurs. If the malfunction is not in the valves, the TROUBLESHOOTING CHART should be used to check for other possible causes of the problem.



*N.O. = Normally Open. All Other Solenoid Valves are Normally Closed.

Figure 6-1. CYCLE GRAPH: PREVACUUM CYCLE.

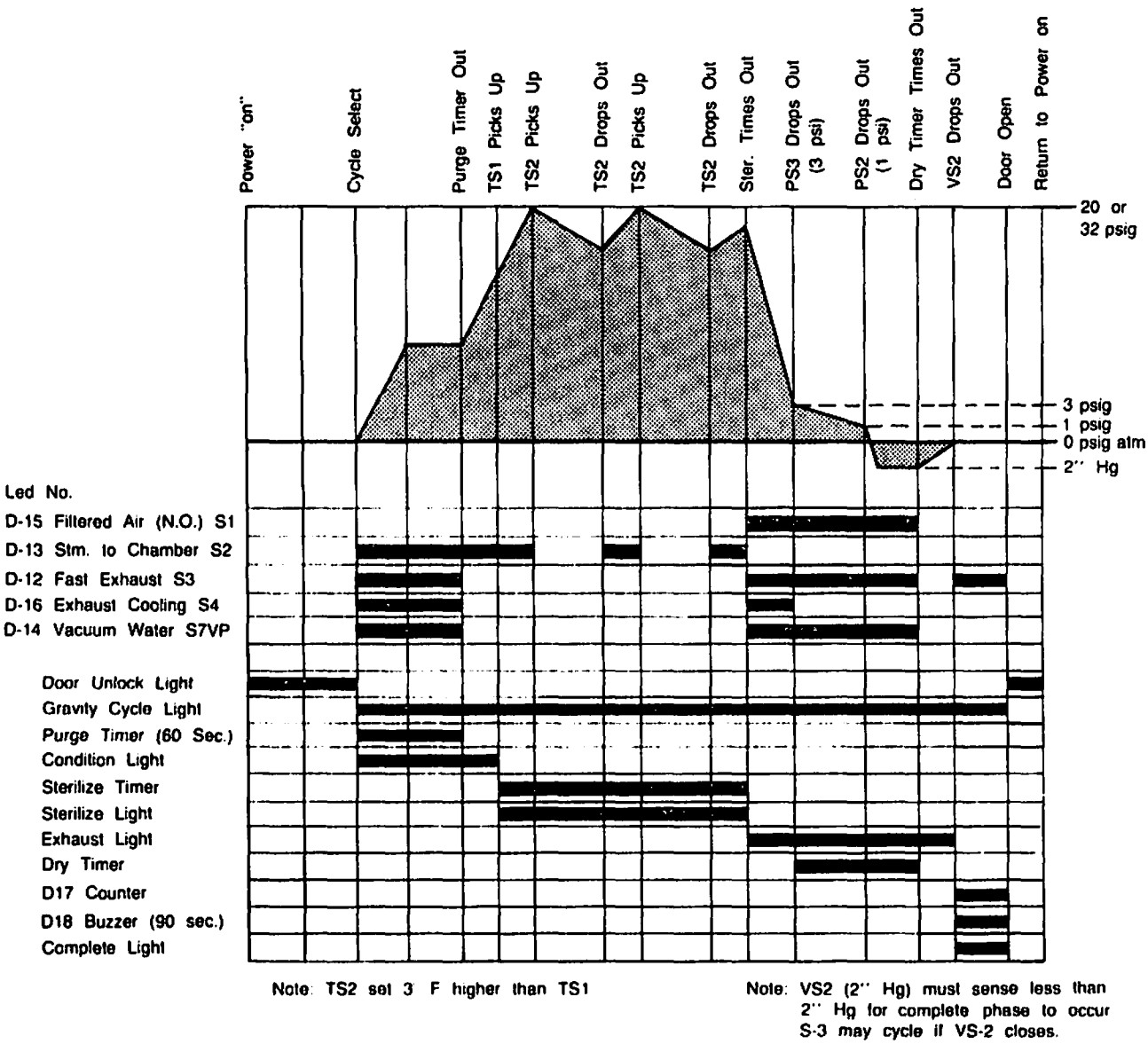


Figure 6-2. CYCLE GRAPH: GRAVITY CYCLE.

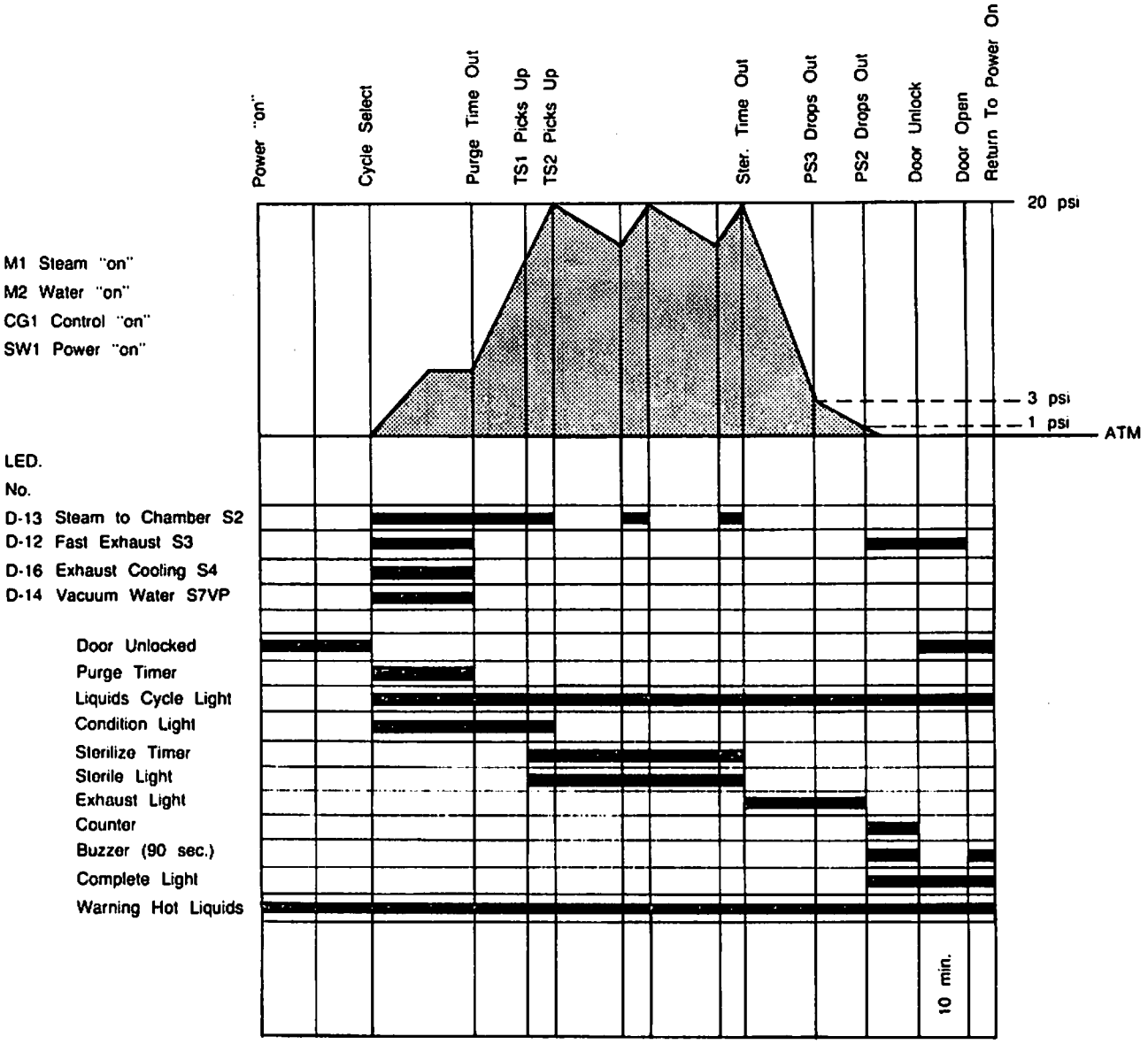


Figure 6-3. CYCLE GRAPH: LIQUIDS CYCLE.

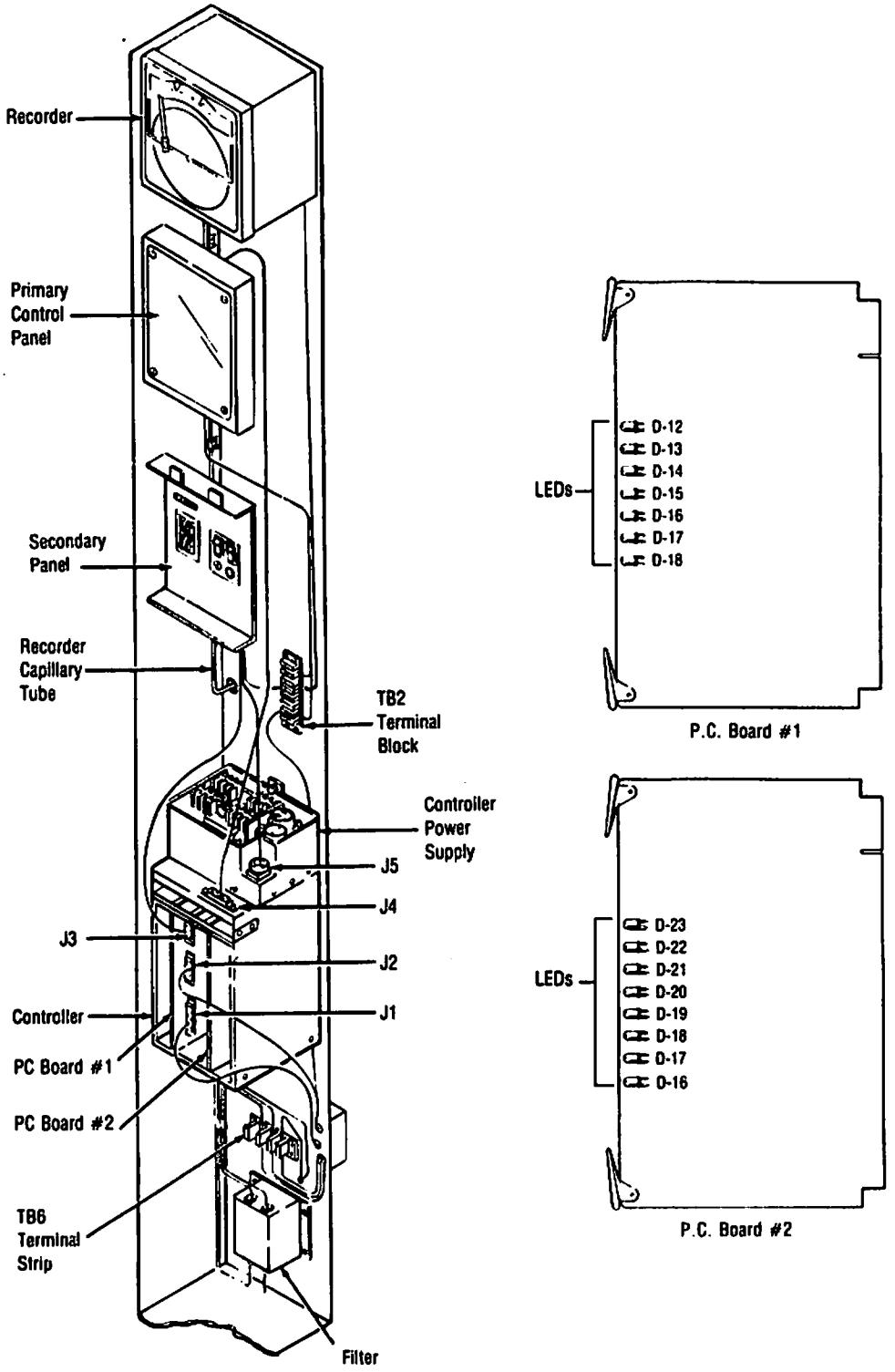


Figure 6-4. CIRCUIT BOARDS WITH LEDs.

6.3 THE TROUBLESHOOTING CHART — EXPLANATION OF ITS CONTENTS

COLUMN HEADING	EXPLANATION
OPERATIONAL STATUS	Select a symptom from this column that most nearly corresponds with the position to which the sterilizer cycle progressed before the trouble occurred.
TROUBLE	Select the problem you think is most appropriate to the particular trouble symptom. The examples are presented in cycle sequence.
POSSIBLE CAUSE AND/OR CORRECTION	**NOTE:** If the symptom for a malfunction is established as mechanical, the electrical components may be omitted and vice versa. This Column lists the specific conditions that should be checked to isolate and correct the one causing the malfunction. The conditions are presented in the order in which they should be checked.
WHERE TO FIND ITEMS IN MANUAL	Location of applicable instructions and/or illustrations are provided in this area. The illustrations or instructions are identified by figure number, paragraph, or table number.

TABLE 6-1: TROUBLESHOOTING CHART

OPERATIONAL STATUS	TROUBLE	POSSIBLE CAUSE AND/OR CORRECTION	WHERE TO FIND ITEMS IN MANUAL
1. Before beginning cycle	1.A. No 120 facility power	1) Check main power source or check 120 VAC between TB6 terminals 1 and 2 — connect or turn on. **NOTE:** If facility power will not reset, isolate and repair short between facility power source and sterilizer.	Fig. 8-38
		2) Circuit breaker CB-2 (RESET circuit breaker on secondary panel) tripped — push to reset. **NOTE:** If breaker will not reset, see item 1. B. under TROUBLE in this table.	Fig 8-38
		3) Control switch CB-1 (CONTROL switch on secondary panel) tripped — reset to ON. **NOTE:** If switch will not remain on, see item 1. C. in this table.	Fig 8-38
		4) Power switch SW-1 (POWER switch on secondary panel) off or defective — turn on; with facility power removed, check switch with ohmmeter and replace if necessary.	Fig. 8-38 Fig. 8-16, 14
		5) Defective line filter (PF-1) — check and replace if necessary.	Fig. 8-38 Fig. 8-11, 11

TABLE 6-1: CONTINUED

OPERATIONAL STATUS	TROUBLE	POSSIBLE CAUSE AND/OR CORRECTION	WHERE TO FIND ITEMS IN MANUAL
1. Continued	1.B. Circuit breaker CB-2 (reset circuit breaker on secondary panel) will not reset	1) Short circuit. With CB-1 off, try to reset CB-2. If CB-2 resets, see next step below, 1.B.2. If CB-2 does not reset, see step 1.B.8.	Fig. 8-38
		2) With CB-1 on, remove P1 and try to reset CB-2. If CB-2 resets, see step 1.B.5. If CB-2 does not reset, see next step, 1.B.3. Replace P1.	Fig. 8-38
		3) With CB-2 off, remove PC board 1 from controller. Try to reset CB-2. If CB-2 resets, replace PC board 1. If CB-2 does not reset, see next step, 1.B.4.	Fig. 8-38 Fig. 8-15, 8 Para. 7-12
		4) With CB-2 off, disconnect P5 from power supply. Try to reset CB-2. If CB-2 resets, replace power supply. If CB-2 does not reset, isolate and repair short between P5 and CB-1.	Fig. 8-38 Fig. 8-15, 1
		5) With CB-2 off, disconnect P1 from controller. Try to reset CB-2. If CB-2 resets, isolate and repair short between P1 and a solenoid valve, the counter, or the buzzer. If CB-2 does not reset, see next step, 1.B.6.	Fig. 8-38
		6) With CB-2 off, remove PC board 1 from the controller. Try to reset CB-2. If CB-2 resets, replace PC board 1. If CB-2 does not reset, reinstall PC board 1, and see next step, 1.B.7.	Fig. 8-38 Fig. 8-15, 8
		7) With CB-2 off, remove PC board 2 from controller. Try to reset CB-2. If CB-2 resets, replace board 2. If CB-2 does not reset, replace controller power supply.	Fig. 8-38 Fig. 8-15, 15 & 1
		8) Disconnect wire #1 connecting CB-2 and TB3 terminal 1. Try to reset CB-2 with CB-1 off. If CB-2 resets, isolate and repair short in recorder circuits. If CB-2 does not reset, replace CB-2.	Fig. 8-17 Fig. 8-16, 7

TABLE 6-1: CONTINUED

OPERATIONAL STATUS	TROUBLE	POSSIBLE CAUSE AND/OR CORRECTION	WHERE TO FIND ITEMS IN MANUAL
1. Continued	1.C. Control switch CB-1 will not set to ON	1) Control switch CB-1 defective. With CB-1 off, disconnect connector P5 from power supply. Try to position CB-1 on. If CB-1 **cannot** be positioned on, replace CB-1. If CB-1 can be positioned on, see 1.C.2 below, and reconnect P5 with CB-1 off.	Fig. 8-38 Fig. 8-16, 13
		2) Short circuit on 5 VDC buss, or defective power supply.	Fig. 6-4 or 6-5
		a) With CB-1 off, disconnect PC boards 1 and 2 and disconnect connector P3 from controller. Try to position CB-1 on. If CB-1 **cannot** be positioned on, replace power supply. If CB-1 can be positioned on, see next step, 1.C.2b.	Fig. 8-38 Fig. 8-15, 1
		b) With CB-1 off, reconnect PC board 1. Try to position CB-1 on. If CB-1 **cannot** be positioned on, replace PC board 1. If CB-1 can be positioned on, see next step, 1.C.2c.	Fig. 8-15, 8 Para. 7.12
		c) With CB-1 off, reconnect PC board 2. Try to position CB-1 on. If CB-1 **cannot** be positioned on, replace PC board 2. If CB-1 can be positioned on, see next step, 1.C.2d.	Fig. 8-15, 15
		d) With CB-1 off, reconnect P3 to controller. Disconnect P16 from primary panel. Try to position CB-1 on. If CB-1 **cannot** be positioned on, isolate and repair short between P3 pin 27 and other wire in the same harness. If CB-1 can be positioned on, replace primary panel.	Fig. 8-38 Fig. 8-10, 24
2. Before beginning cycle; POWER & CONTROL switches on	2.A. Primary Panel remains completely dark	1) Loss of all power — see TROUBLE item 1A for checks and remedies.	
		2) P5 on control power supply disconnected or pins loosely connected — check and reconnect.	Fig. 8-38
		3) P16 disconnected or loosely connected — reconnect.	Fig. 8-10, 24

TABLE 6-1: CONTINUED

OPERATIONAL STATUS	TROUBLE	POSSIBLE CAUSE AND/OR CORRECTION	WHERE TO FIND ITEMS IN MANUAL
2. Continued		4) Control power supply defective — check for 5 VDC and 28 VDC and replace power supply if necessary.	Fig. 8-15, 1
		5) Disconnect P16 from primary panel. Check 28 VDC between pins 35 and 14. Check 5 VDC between pins 24 and 14. If voltages check good, replace primary panel. If voltages are not present, repair P16 wire harness.	Fig. 8-10, 24
	2.B. Primary panel remains dark except for timer numbers	1) Loss of 28 VDC. Check 28 VDC power supply output. **CAUTION: If output is not present, make short circuit test between pins 6 and 2 of receptacle J10 on Mother Board before connecting new power supply. If short circuit is found it must be isolated and repaired prior to connecting new supply.**	Fig. 8-15, 1
		2) Open circuit. Disconnect P16 from primary panel and check 28 VDC between pins 35 and 14. If voltage check good, replace primary panel. If voltage is not present, repair A6 wire harness.	Fig. 8-10, 24
	2.C. One or more legends on primary panel fail to light	1) Lamp burned out. Check with ohmmeter, and replace if necessary.	Fig. 8-10, 24 Para. 7.12
		2a) Logic card defective. Check voltage across lamp socket. If it is 28 VDC, replace primary panel. If it is zero, see step below, 2.C.2b.	Fig. 8-10, 24 Para. 7.12
		2b) Reinstall lamp and check VDC from lamp socket to TB2, terminals 3, 4, or 5. If it is zero, replace primary panel. If it is 28 VDC, see step below, 2.C.2c.	Fig. 8-38 Fig. 8-10, 24 Para. 7.12
		2c) Disconnect P3 from controller. Check VDC between J3, pin 28 and pin applicable for malfunctioning lamp. If it is zero, replace logic card. If it is 28 VDC, see step below, 2.C.3.	Fig. 8-38 Fig. 8-10, 24 Para. 7.12

TABLE 6-1: CONTINUED

OPERATIONAL STATUS	TROUBLE	POSSIBLE CAUSE AND/OR CORRECTION	WHERE TO FIND ITEMS IN MANUAL
2. Continued		3) Disconnect P16 from primary panel and check continuity between P16 and P3 on pins applicable for malfunctioning lamp. If okay, replace primary panel. Otherwise isolate and repair open in cable.	Fig. 8-38 Fig. 8-10, 24 Para. 7.12
	2.D. One or more legends on primary panel lit when should be off	1) Control system did not reset — push cycle reset pushbutton. **NOTE:** If system does not reset see TROUBLE symptom 2.F below.	Fig. 8-38
		2) Logic card defective. Disconnect P3 from controller. If light goes out, replace logic card. If light remains on, see next step, 2.D.3.	Fig. 8-38 Fig. 8-10, 24 Para. 7.12
		3) Short circuit. Isolate and repair short in either wire harness or primary panel. Disconnect P16 from primary panel as required. Replace primary panel if necessary.	Fig. 8-38 Fig. 8-10, 24 Para. 7.12
	2.E. Incorrect timer display	1) See Timer Display Checkout and Correction Charts, paragraph 6.4, following this Troubleshooting Chart.	Table 6-2
	2.F. Unable to reset system	1) Open circuit. Disconnect P4 from controller and make continuity check between pins 8 and 1 with RESET (CB-2) button pressed and released. If continuity is present with switch actuated, replace controller PC board 1. If continuity is **not** present, see next step, 2.F.2.	Fig. 8-38 Fig. 8-15, 8
		2) Make continuity check across contacts of RESET (CB-2) switch. If continuity is present, isolate and repair open in P4 wire harness. If continuity is **not** present, replace switch.	Fig. 8-38 Fig. 8-16, 7
	2.G. Unable to select cycle	1) No DOOR LOCKED signal. a) Adjust or replace door lock switch as required.	Fig. 8-21 Para. 7.13

TABLE 6-1: CONTINUED

OPERATIONAL STATUS	TROUBLE	POSSIBLE CAUSE AND/OR CORRECTION	WHERE TO FIND ITEMS IN MANUAL
2. Continued		b) Disconnect P2 from controller and check continuity between Pin J and TB2 terminals 3, 4, or 5. If continuity is present, replace controller PC board 1. If continuity is not present, see next step, 2.G.1c.	Fig. 8-38 Fig. 8-15, 8 Para. 7.12
		c) Check continuity across contacts of door lock switch(es). If continuity is present, isolate and repair open in P2 wire harness. If continuity is not present, adjust or replace door lock switch as required.	Fig. 8-21 Fig. 8-38
		2) Controller PC board 1 defective. Disconnect P3 from controller and check continuity between pin applicable to specific switch and TB2 terminal 3, 4, or 5. If continuity is present, replace controller PC board 1. If continuity is not present, see next step, 2.G.3.	Fig. 8-38 Fig. 8-15, 8
		3) Cycle select switch defective or open wire. Disconnect P16 from primary panel and check continuity between J16 pin applicable to specific switch and pin 34. If continuity is present, isolate and repair open P3 wire harness. If continuity is not present, replace primary panel.	Fig. 8-10, 24
	2.H. Jacket pressure does not rise to required level	1) Steam supply less than 50 psig minimum — check supply pressure and increase if necessary.	Fig. 8-23, 4
		2) HI-LO steam control valve malfunctioning — adjust, repair, or replace as necessary.	Fig. 8-26, 6 Para. 7.10
		3) Manual STEAM supply valve malfunctioning — repair or replace, as necessary.	Fig. 8-26, 3 Para. 7.11
		4) Jacket return steam trap malfunctioning — replace.	Fig. 8-25, 27 Para. 7.6
		5) Steam supply strainer plugged — clean.	Fig. 8-26, 1 Para. 7.7

TABLE 6-1: CONTINUED

OPERATIONAL STATUS	TROUBLE	POSSIBLE CAUSE AND/OR CORRECTION	WHERE TO FIND ITEMS IN MANUAL
2. Continued	2.I. Steam enters chamber while door is open	1) Manual operating valve (if supplied) improperly adjusted or malfunctioning — turn valve to OFF; adjust, repair, or replace multiport valve.	Fig. 8-35, 1
		2) Steam-to-chamber solenoid valve (S-2) not operating correctly (should be closed) — check valve for leak, replace if necessary; check D13 LED on PC board 1, replace board if LED on.	Fig. 8-24, 30 Fig. 8-15, 8 Para. 7.5 Para. 7.12
3. During a cycle	3.A. Cycle does not advance during pre-vacuum phase	1) Leaks in chamber piping and/or door gasket — check for leaks, repair; replace gasket.	Fig. 8-20, 1 Para. 7.3
		2) Vacuum switch VS-1 defective or setting drifted.	Fig. 8-7, 2
		a) Reset to 10'' Hg or replace.	Para. 7.14
		b) Disconnect P2 from controller and check continuity between pin R and TB2 terminals 3, 4, or 5. Isolate and repair wiring or replace switch. If check ok, replace PC board 1.	Fig. 8-38 Fig. 8-15, 8 Para. 7.12
		3) Pressure switch PS-1 defective or setting drifted.	Fig. 8-7, 1
		a) Reset to 26 psig or replace.	Para. 7.14
		b) Disconnect P2 from controller and check continuity between pin S and TB2 terminals 3, 4 or 5. Isolate and repair wiring or replace switch. If check ok, replace PC board 2.	Fig. 8-38 Fig. 8-15, 15 Para. 7.12
		4) Pressure switch PS-3 defective or setting drifted.	Fig. 8-7, 1
		a) Reset to 4 psig or replace.	Para. 7.14
		b) Disconnect P2 from controller and check continuity between pin L and TR-2 terminals 3, 4, or 5.	Fig. 8-38

TABLE 6-1: CONTINUED

OPERATIONAL STATUS	TROUBLE	POSSIBLE CAUSE AND/OR CORRECTION	WHERE TO FIND ITEMS IN MANUAL
3. Continued		5) Water ejector valve (S-7) not operating correctly — should be open for drying time.	Fig. 8-27, 4
		a) Repair or replace valve.	Para. 7.5
		b) Check wiring to valve — repair or replace.	Fig. 8-37, 10
		c) Check LED D-14 on PC board 1 — should be on during vacuum part of pre-vacuum phase. Replace board if light not on.	Fig. 8-15, 8
		d) 5b and 5c ok — replace board 1.	Para. 7.12
		6) Inadequate temperature in chamber — possible causes and corrections are as follows:	
		a) Operator settings on recorder and HI-LO valve do not correspond — set recorder and valve properly.	Sect. 2
		b) Chamber drain line or strainer plugged — clean line or strainer.	Para. 4.4
		c) Chamber drain line trap not operating correctly — replace trap element.	Fig. 8-25, 27 Para. 7.6
		d) Chamber drain solenoid valve (S-3) not operating correctly (should be closed during pressurized part of prevacuum phase). Repair or replace valve. Check LED D-12 — if on, replace PC board 1.	Fig. 8-25, 1 Fig. 8-15, 8 Para. 7.5 Para. 7.12
		7) Steam-to-chamber solenoid valve (S-2) not operating correctly (should be open during pressurized part of prevacuum phase).	Fig. 8-24, 35
		a) Repair or replace valve.	Para. 7.5
		b) Check wiring to valve — repair or replace.	Fig. 8-37, 10

TABLE 6-1: CONTINUED

OPERATIONAL STATUS	TROUBLE	POSSIBLE CAUSE AND/OR CORRECTION	WHERE TO FIND ITEMS IN MANUAL
3. Continued		c) Check LED D-13 on PC board 1 — should be on during vacuum part of prevacuum phase. Replace board if light not on.	Fig. 8-15, 8 Para. 7.12
		d) 7b and 7c ok — replace board 1.	Fig. 8-15, 8 Para. 7.12
		8) No pressure in jacket — see 2.H, above, "Jacket pressure does not rise. . . ."	
	3.B. Number of pulses (pressure and vacuum) not correct during prevacuum conditioning phase	1) Pulse selection switch set incorrectly or defective. Adjust switch to correct setting.	Para. 7.12
		2) Replace PC board 2. Replace PC board 1.	Fig. 8-15, 8 Fig. 8-15, 15
	3.C. Chamber temperature does not rise to recorder setting	1) See 3.A.6, above.	
	3.D. Steam does not enter chamber in sterilize phase	1) Chamber drain valve (S-3) not closed or leaking. See 3.A.6d, above.	Fig. 8-25, 5
		2) Steam-to-chamber valve (S-2) not open or sticking. See 3.A.7, above.	Fig. 8-24, 35
		3) No pressure in jacket. See 2.H, above.	
	3.E. Chamber pressure does not rise during sterilize phase	1) Chamber drain valve (S-3) not closed or leaking. See 3.A.6d, above.	Fig. 8-25, 5
		2) Steam-to-chamber solenoid valve (S-2) not operating correctly (should be open). See 3.A.7, above.	Fig. 8-24, 35
		3) No pressure in jacket. See 2.H, above.	
	3.F. Chamber pressure and temperature drop during cycle	1) Steam supply pressure erratic — check steam supply.	

TABLE 6-1: CONTINUED

OPERATIONAL STATUS	TROUBLE	POSSIBLE CAUSE AND/OR CORRECTION	WHERE TO FIND ITEMS IN MANUAL
3. Continued		2) Chamber drain line trap not operating correctly — replace trap element.	Fig. 8-25, 5 Para. 7.6
		3) Chamber drain solenoid valve (S-3) not operating correctly (should be closed). Repair or replace valve. Check Check LED-12 — if on, replace PC board 1.	Fig. 8-25, 5 Fig. 8-15, 8 Para. 7.5 Para. 7.12
	3.G. Pressure too high, temperature too low during sterilize phase	1) Air trapped in chamber because of clogged strainer or drains — clean strainer inside chamber, flush and clean drain line and traps.	Para. 4.4
		2) Chamber trap defective — replace element.	Fig. 8-25, 5 Para. 7.6
	3.H. Steam blows out around door during sterilize phase	1) Door gasket worn or defective — replace.	Fig. 8-20, 1 Para. 7.3
	3.I. Excessive steam in area during cycle	1) Strainer in cold water line clogged — clean.	Fig. 8-27, 13 Para. 7.7
		2) Insufficient flow through cooling water flow control valve — clean, adjust, repair or replace flow control valve.	Fig. 8-29, 14 Para. 5.4
		CAUTION: If safety valve is found to be defective, do not attempt to repair. Replace with new valve.	
		3) Safety valve popping or bleeding — check for source of excessive pressure.	Fig. 8-23, 16
		4) Leaking steam valve — check valves and piping for leaks, repair.	Fig. 8-23, 4 Fig. 8-24, 30
		5) Cooling water valve (S-4) not operating correctly (should be open during exhaust and dry).	Fig. 8-29, 17
		a) Repair or replace valve.	Para. 7.5
		b) Check wiring to valve — repair or replace.	Fig. 8-37, 10

TABLE 6-1: CONTINUED

OPERATIONAL STATUS	TROUBLE	POSSIBLE CAUSE AND/OR CORRECTION	WHERE TO FIND ITEMS IN MANUAL
3. Continued		c) Check LED D-16 on PC board 1 — should be on during exhaust and dry. Replace board if light not on.	Fig. 8-15, 8
		d) 5b and 5c ok — replace PC board 1.	Fig. 8-15, 8
	3.J. Steam and/or condensate leaking around door lock clutch rod	1) Steam lock diaphragm cracked or diaphragm gasket faulty — replace diaphragm or gasket.	Fig. 8-19, 5 & 6 Para. 7.3
	3.K. Safety valve pops or bleeds excessively	1) HI-LO steam control valve improperly adjusted or malfunctioning — adjust, repair, or replace valve.	Fig. 8-26, 6 Para. 7.14
		2) Safety valve defective — replace.	Fig. 8-23, 16
4. During "DRY" part of Exhaust phase — Gravity cycle only	4.A. Dry timer does not start and cooling water valve (S-4) does not close in exhaust phase	1) Pressure switch PS-3 defective or malfunctioning — reset to 4 psig or replace.	Fig. 8-7, 1 Para. 7.14
		2) Disconnect P2 from controller and check continuity between pin L and TB2 terminals 3, 4, and 5 — If ok, replace PC board 1. Otherwise, isolate and repair wiring or replace switch.	Fig. 8-38 Fig. 8-15, 8 Para. 7.12
	4.B. Dry timer starts and cooling water valve closes immediately after sterilize phase	Same as 4.A, immediately above.	
5. During Exhaust phase of Liquids cycle	5.A. Slow exhaust too rapid — solutions spill or pop caps	1) Chamber drain line trap not operating correctly — replace trap element.	Fig. 8-25, 27 Para. 7.6
		2) Slow exhaust needle valve malfunctioning — clean, adjust, repair or replace valve.	Fig. 8-23, 11 Para. 5.4
		3) Pressure switch PS-3 misadjusted or defective — reset to 4 psig or replace.	Fig. 8-7, 1 Para. 7.14
		4) Open or shorted wire — disconnect P2 from controller, check continuity between pin L and TB2 terminals 3, 4, or 5. If okay, replace PC board 1. Otherwise isolate and repair wiring or replace switch.	Fig. 8-38 Fig. 8-15, 8 Para. 7.12

TABLE 6-1: CONTINUED

OPERATIONAL STATUS	TROUBLE	POSSIBLE CAUSE AND/OR CORRECTION	WHERE TO FIND ITEMS IN MANUAL
6. At end of cycle	6.A. Cycle fails to reach COMPLETE after exhaust completed, or signals COMPLETE too soon	1) Pressure switch PS-2 or vacuum switch VS-2 defective — reset, respectively, to 2 psig or 2" Hg or replace.	Fig. 8-7, 1 & 2 Para. 7.14
		2) Open or shorted wire — disconnect P2 from controller and check continuity of pressure and vacuum switch circuits, i.e., between pins T and K and applicable TB-2 terminals. See electrical schematic for test points.	Fig. 8-38 Fig. 6-5 or 6-6
	6.B. Buzzer does not sound when COMPLETE light is on	1) Buzzer defective — check voltage across buzzer, replace if necessary.	Fig. 8-16, 4
		2) Open wire — disconnect P1 from control and check continuity between pin W and TB3 terminal 2. Isolate and repair.	Fig. 8-38 Fig. 8-17
		3) PC board 1 defective — check D18 LED on board; replace board 1 if LED does not come on at end of cycle.	Fig. 8-15, 8
	6.C. Doors can be unlocked but cannot be opened when the buzzer sounds	1) Vacuum in chamber caused by faulty check valve in vacuum break line — replace check valve.	Fig. 8-28, 3
		2) Vacuum break line plugged — clean or replace plugged components in line.	Fig. 8-28
		3) Vacuum switch VS-2 out of adjustment or defective — reset VS-2 to 0-1" Hg or replace.	Fig. 8-7, 2 Para. 7.14
	6.D. Excessive steam when door is opened or excessive effort needed to unlock door when buzzer sounds	1) Pressure switch PS-2 out of adjustment or defective — reset PS-2 to 1-2 psig or replace.	Fig. 8-7, 1 Para. 7.14
	6.E. Goods are wet after completion of "wrapped" cycle, or excessive vapor in chamber when door is opened	1) Vacuum break line plugged — clean or replace filter.	Fig. 8-28
		2) Check valve in drain line defective — replace.	Fig. 8-25, 11

TABLE 6-1: CONTINUED

OPERATIONAL STATUS	TROUBLE	POSSIBLE CAUSE AND/OR CORRECTION	WHERE TO FIND ITEMS IN MANUAL
6. Continued		3) Vacuum water valve (S-7) not operating correctly (should be open for drying time).	Fig. 8-27, 4
		a) Repair or replace valve.	Para. 7.5
		b) Check wiring to valve — repair or replace.	Fig. 8-37, 10
		c) Check LED D-14 on PC board 1 — should be on for drying time. Replace board if light not on.	Fig. 8-15, 8 Para. 7.12
		d) 3b and 3c ok — replace PC board 1.	Fig. 8-15, 8 Para. 7-12
		4) Cooling water valve (S-4) not operating correctly (should be open during exhaust and dry).	Fig. 8-29, 17
		a) Repair or replace valve.	Para. 7.5
		b) Check wiring to valve — repair or replace.	Fig. 8-37, 10
		c) Check LED D-16 on PC board 1 — should be on during exhaust and dry. Replace board if light not on.	Fig. 8-15, 8 Para. 7.12
		d) 4b and 4c ok — replace board 1.	Fig. 8-15, 8 Para. 7.12
	6.F. Water in chamber or door channel at end of cycle	1) Chamber drain valve (S-3) not operating correctly (should be open during exhaust and dry).	Fig. 8-30, 21
		a) Repair or replace valve.	Para. 7.5
		b) Check wiring to valve — repair or replace.	Fig. 8-37, 10
		c) Check LED D-12 on PC board 1 — should be on during exhaust and dry. Replace board if light not on.	Fig. 8-15, 8 Para. 7.12
		d) 1b and 1c ok — replace PC board 1.	Para. 7.12

TABLE 6-1: CONTINUED

OPERATIONAL STATUS	TROUBLE	POSSIBLE CAUSE AND/OR CORRECTION	WHERE TO FIND ITEMS IN MANUAL
6. Continued		2) Vacuum water valve (S-7) not operating correctly (should be open for drying time). See 6.E.3, above.	Fig. 8-27, 4
		3) Cold chamber floor caused by condensate accumulating in lower jacket — check return line strainer and clean if necessary; check operation of jacket return trap and replace trap if necessary; check for back pressure on return steam line, locate source and eliminate.	Fig. 8-30, 4 Fig. 8-30, 6 Para. 7.6 Para. 7.7
		4) Chamber floor not pitched toward drain — see leveling procedure.	Para. 5.3
		5) Drains plugged or clogged — see drain cleaning procedure.	Para. 4.4
		6) Chamber steam trap does not open — replace trap element.	Fig. 8-30, 27 Para. 7.6
		7) Steam not "dry" — check steam quality.	
		8) Drain line check valve defective — replace.	Fig. 8-25, 11
	6.Q. Cycle counter fails to update on cycle complete	1) Counter defective - - check voltage across counter and replace, if necessary.	Fig. 8-16, 4
		2) Open wire — disconnect P1 from control and check continuity between pin P and TB3 terminal 2. Isolate and repair open.	Fig. 8-38 Fig. 8-17
		3) PC board 1 defective — check D-17 LED on board: replace board if LED does not come on at end of cycle.	Fig. 8-15, 8
7. Miscellaneous	7. A. Continuous sounding buzzer whenever machine is turned on	1) Excessive current leakage from triac — bend buzzer clapper away from coil until buzzing stops.	Fig. 8-16, 4

6.5 TIMER DISPLAY CHECKOUT AND CORRECTION CHARTS

1. Between cycles the primary panel timer displays can be checked by rotating the appropriate thumbwheel switches on the secondary panel. Before beginning the checkouts below, first push the RESET button to assure that the incorrect timer display is not caused by failure to reset the control system.

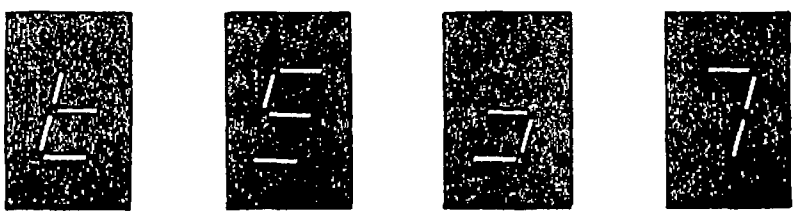
2. If **part of a number** fails to illuminate, rotate the appropriate thumbwheel switch and verify the segment failure. Correct by replacing the primary panel.

3. If an **entire number** fails to illuminate, disconnect P4 from controller. Check for proper functioning of each display segment by following this procedure: Carefully jump, one at a time, the P4 connector pins (as listed in Table 6-2) to ground (TB2 terminals 3, 4, or 5, as applicable). Compare the segments actually illuminated with the pattern which should be indicated (pattern A, B, C, or D). If the pattern actually illuminated differs from the pattern illustrated, perform a continuity check of the wire. If the wire is good, then the primary panel must be replaced.

TABLE 6-2: TEST PATTERNS — THUMBWHEEL SWITCHES

P4 Connector Pin	"STERILIZE" READOUT, 10's digit, (IC1), should indicate pattern:	"STERILIZE" READOUT, unit's digit (IC2), should indicate pattern:	"DRY" READOUT, 10's digit (IC3), should indicate pattern:	"DRY" READOUT unit's digit (IC4), should indicate pattern:
26 27 28 29	A B C D			
30 31 32 33		A B C D		
34 35 36 37			A B C D	
18 17 16 15				A B C D

TEST PATTERNS FOR CORRECTLY FUNCTIONING DIGITAL DISPLAYS



A B C D

4. If an **entire number** fails to illuminate, check for correct functioning of the thumbwheel switches by following this procedure: Disconnect P3 and P4 from the controller. Make the following continuity check across the thumbwheel switches, according to the switch settings indicated in Table 6-3. Place the negative lead on P4-3 or P4-20. If the continuity is bad, replace the appropriate thumbwheel switch and/or repair the open circuit in the wire harness. If the continuity check is good, replace controller Board 1.

TABLE 6-3: CONTINUITY CHECK — THUMBWHEEL SWITCHES.

STERILIZE TIME THUMBWHEEL	
Switch Setting	Continuity Path to P4-3 From Pins
01	P3-1
02	P3-2
03	P3-1 and P3-2
04	P3-3
05	P3-1 and P3-3
06	P3-2 and P3-3
07	P3-1, P3-2 and P3-3
08	P3-4
09	P3-1 and P3-4
10	P4-9
20	P4-10
30	P4-9 and P4-10
40	P4-11
50	P4-9 and P4-11
60	P4-10 and P4-11
70	P4-9, P4-10 and P4-11
80	P4-12
90	P4-9 and P4-12
00	NONE

DRY TIME THUMBWHEEL	
Switch Setting	Continuity Path to P4-20 From Pins
01	P3-1
02	P3-2
03	P3-1 and P3-2
04	P3-3
05	P3-1 and P3-3
06	P3-2 and P3-3
07	P3-1, P3-2 and P3-3
08	P3-4
09	P3-1 and P3-4
10	P4-9
20	P4-10
30	P4-9 and P4-10
40	P4-11
50	P4-9 and P4-11
60	P4-10 and P4-11
70	P4-9, P4-10 and P4-11
80	P4-12
90	P4-9 and P4-12
00	NONE

SECTION 7

SECTION 7

COMPONENT REPAIR, REPLACEMENT, AND ADJUSTMENT

7.1 GENERAL

This section includes instructions for the disassembly, repair, and replacement of selected sterilizer components. Exploded views and assembly drawings showing the various parts and assemblies referred to are included in Section 8.

7.2 INDICATOR-RECORDER-CONTROLLER

NOTE: The swing out panel is hinged to the case, for access to the internal components, such as the drive motor (Fig. 8-14, 1), reed switches (3), and adjusting screws. To gain access, open the door, loosen the captive screw located at the lower right hand corner of the backing plate, and swing the plate out.

Starting Ink Flow (Fig. 8-13)

1. Lift pen by loosening chart hub cap (4).

2. Remove cap from ink cartridge pen tip (6).

3. Insert a small piece of paper under the pen and move it slightly back and forth to initiate flow. If necessary, moisten pen tip.

Changing The Chart (Fig. 8-13)

1. Unscrew the hub cap (4). This cap retains a spring loaded wire bracket, which acts as a pen lifter (2). Hold this bracket while unscrewing cap.

2. With hub and pen away from the chart, lift chart (3) off hub, and remove.

3. Slip new chart under pen arm and locate on hub. Replace hub cap loosely.

4. Rotate chart until pen rests on proper time arc. Press chart flat against dial plate.

5. Tighten hub cap firmly, taking care that chart remains in proper position.

Replacing Ink Cartridge (Fig. 8-13)

1. Lift ink cartridge (6) from chart by loosening hub cap.

2. Grasp cartridge near tip end.

3. Pull straight off, with a steady pull. Be careful not to distort pen arm.

4. Support pen arm with one hand. Slide cartridge into engagement with clip.

5. Holding pen arm, slide cartridge onto the arm, until the tip boss is properly positioned against the end of the arm.

Adjustment of Temperature Control (Fig. 7-1)

1. Turn adjusting screw on reed switches clockwise to increase temperature settings, counterclockwise to reduce settings. (TS-1 controls timer actuator, TS-2 controls steam to chamber.) TS 2 275 | 349°F

See 7-13

2. Adjusting screw on pen arm is used to make minor corrections in pen setting.

Removal and Replacement

CAUTION: Recorders should be handled with care, and caution should be exercised when making changes to ensure against kinking or compressing the capillary system. The bulb, tubing and pressure element are filled with a fluid approved by the Scientific Instrument Makers Association and form a sealed system. This system must never be broken. Even the most minute leak will render it inoperative. Excess capillary should be formed into an 8-inch diameter coil and properly supported by taping to any smooth unheated surface.

Removing Recorder

1. Remove primary panel . . . see Paragraph 7.12.

2. Open chart back-up plate (see note above.)

3. Make sure power is off. Disconnect electrical leads by pulling the plug at the bottom of the recorder, behind the gauges.

4. Disconnect capillary tube from chamber drain tee behind control console. (USE CARE!)

5. Remove capillary from three clips at (Fig. 8-10,23) rear of console.

6. Remove the two mounting screws at rear of case.

7. Remove recorder, gently feeding the capillary and its bulb through the grommet.

Replacing the Recorder

1. **Carefully** direct the capillary tube and bulb behind the primary and secondary panels, through the grommet above the controller, to the chamber drain tee.

2. Plug connector into socket on recorder. Position recorder and replace the two screws and washers which were removed.

3. Replace the capillary beneath the three clips.

4. Reconnect the bulb into chamber drain tee.

5. Secure any wires which were loosened.

6. Replace primary panel.

7.3 CHAMBER DOOR ASSEMBLY

Some repairs can be made without removing the door from the sterilizer. For major repairs the door should be removed and placed on a clean padded work bench or table.

Removing Door From Hinges (Fig. 8-19)

1. With door open and supported, remove the retaining rings (14) from each of the hinge pins.

2. Withdraw the pins (15) and slide the door and hinge assembly out of the hinge body, saving any washers assembled with the door.

3. Place the door on a clean padded bench with the chamber door handle facing upward.

4. If it is necessary to remove the hinge body, remove the four capscrews that fasten it to the door frame.

Disassembling Door

1. Turn the chamber door handle to retract the chamber door arms.

2. Turn the button assembly (8-18, 10) counterclockwise until it disengages and remove it.

3. Remove setscrews (9), handwheel, grease fitting (8-19, 27), screws, washers, handle nut (28), thrust ring assembly (26), and springs (40).

4. Remove the self-tapping screws (Fig. 8-18, 15) and lift off the chamber door cover (8).

5. If door cover brackets (Fig. 8-19, 16) are damaged, remove them by removing the self-tapping screws (18) which held them in place. Replace brackets.

6. Remove any worn speednuts (17) and slip new speednuts over the door cover brackets.

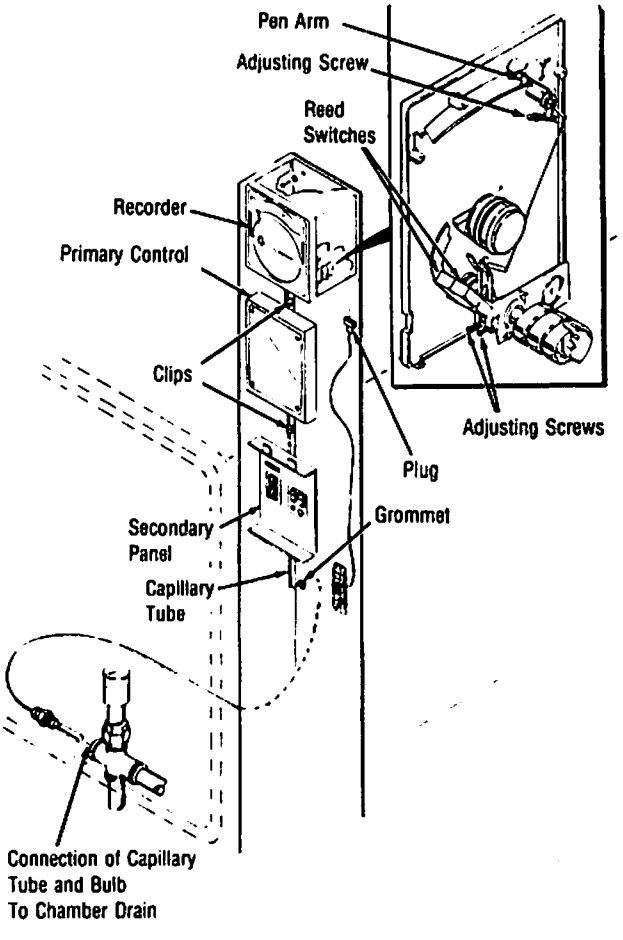


Figure 7-1. REPLACING THE RECORDER.

7. Remove hex head screws, plain washers, lockwashers (11, 12, 13) and door hinge bracket (2) from the door.

8. Remove drive pin (25) from handle nut and bearing from recess in top socket plate (29).

9. Remove socket head screws (23) and washers (39).

10. Slide the top socket plate (29) forward and withdraw the roll pins and washers.

11. Remove the top socket plate and the door arms.

12. If necessary, loosen, but do not remove the arm clip links and studs. Arm clip studs retain shims under the fulcrums which align the arms to seal the door against the door frame. If the arm clip studs must be removed, be sure that arm clip studs and shims are replaced in the same location during reassembly.

13. Remove the bottom socket plate (30).

14. Turn the door over and remove the screws (8-18, 7) holding door back cover in place.

15. Remove door back cover and the gasket (6). Discard the gasket.

16. Using a socket wrench, remove the screws (3) holding the diaphragm cover in place.

17. Remove the diaphragm cover (4), diaphragm (5) and gasket (6).

18. Pull out the thrust plate (8), lock clutch (9) and lock clutch rod spring (10).

CAUTION: The door post (8-20, 10) is welded to the lock clutch ring. If it is necessary to disassemble the door further, contact AMSCO for instruction for removing weld and rewelding.

Cleaning And Inspection

1. Clean all working parts with a solvent (such as Stoddard solution) and remove all gum or grease from bearing and wear surfaces.

2. Wipe all parts dry with a clean, lint-free cloth.

3. Inspect all parts for wear, cracks, chipping or other damage.

4. Examine door post key, keyway and threads.

5. Excessive wear may cause the closing mechanism to jam. If necessary, replace parts to make handwheel action smooth.

6. Examine diaphragm for breaks or distortion. Replace if necessary.

7. When steam lock diaphragm has been removed, always use a new diaphragm gasket when reassembling.

Reassembling Door (Figure 8-19)

Lubricate parts indicated with Neptune-7 grease (P/N 385220-091).

1. Replace back cover, align, and secure with 12 drive screws.

2. Turn door over, and replace any missing or damaged cover clips and speed nuts (16, 17)

3. Replace any arm clip studs and fulcrum blocks which may have been removed. Be sure that shims are replaced in their proper positions. Drive fulcrum blocks down with a wood block and mallet. Replace arm clip links (31 thru 34).

4. Replace hinge assembly, if removed.

5. Lubricate door post threads, and place two wood blocks about 2 inches thick on the door, to hold the bottom socket plate up. Slide bottom socket plate in position (30).

6. Set two keys (22) in door post, and drive two roll pins (21) into socket plate (29).

7. Place top socket plate over door post, and position four corner arms and eight side arms to door. Secure top socket plate to bottom plate with six socket-head screws. Check arm movement for freedom.

8. Pack thrust bearing (24) and insert into socket plate. Replace drive pin (25). Lubricate wheel nut (28) inside and outside, and screw onto door post.

9. Assemble thrust ring and springs (26) and position in nut. Screw nut all the way down, guiding the ball thrust bearing onto nut. Secure with two screws and washers (19, 20).

10. Remove the two wood blocks. Lower arms, and check assemblage for freedom of movement. Free up as necessary. Drive grease fitting in.

11. Raise arms, and stand door on end. Try clutch rod (9) in post. Free movement if necessary. Lubricate rod, and insert it with spring into door. Engage thrust plate (8), and lubricate.

NOTE: Graphited face of gasket is next to door casting.

12. Assemble diaphragm, gasket, and cover (4, 5, 6) and secure in place with nine screws.

NOTE: Gaskets are cut to fit snugly and must be forced in. Push in a short section at a time. **Do not stretch.** If gasket seems too long, **do not cut it,** but remove it, and start over, compressing short sections as they are inserted in the groove, to take up the full length.

13. Clean gasket groove, and install new gasket.

14. After installing gasket, spray seating surface of end ring with **AMSCO Fluorocarbon Lubricant,** to prevent sticking.

15. Wipe door carefully with a clean cloth, to remove excess grease.

Reassembling Door And Hinges To Sterilizer

1. Set door into place with door hinge between ears of hinge body.

2. Position and secure hinge pins with washers and retaining rings.

NOTE: Proper centering of door in the field is best accomplished as follows:

1. Center door on sterilizer body.

2. Chalk surface of gasket and check position of gasket. Space between inner edge of gasket and edge of chamber opening should be uniform on all sides.

3. Check for full engagement of locking arms. Engagement in end ring should be uniform for all arms.

Door Alignment

After reassembling and centering the door, ensure that door arms are engaged in door frame at least 1/4 inch with door normally tightened (approximately 30 ft-lb locking torque). Reshim door arms, if necessary, to obtain proper arm contact when door arms are in end frame. Shimming procedure is as follows:

1. Tighten door to compress gasket in position.

2. Back off until door arms are loose. Then tighten door to approximately 8 ft-lb torque.

3. Ensure that all arms are tightened. If any arm is loose, determine thickness of shim required to bring loose arm to a height that will cause it to be as tight as the existing tight arms.

4. Disengage arms, open door, and install shims where required.

5. Close door, tighten door to approximately 8 ft-lb torque, and check all arms to ensure that they are of equal tightness. Repeat steps 3 and 4, if necessary, until this equal tightness requirement is met.

6. Disengage arms and place an additional .010 shim under each corner arm.

7. Slowly tighten door while checking to ensure that the corner arms engage and become tight before any other arm. If necessary, repeat prior steps until this requirement is met.

NOTE: Use the following shims:

P-39910 — .005
P-39911 — .010
P-39912 — .015

To meet the requirements of step 7, the maximum additional shim permitted under a corner arm is .005.

Diaphragm Operation Check

After replacing and reassembling the diaphragm, ensure that the door properly locks and unlocks under operating pressure. Door should lock between 1/2 and 6 psig rising steam pressure and unlock between 1/2 and 5 psig falling steam pressure.

7.4 AIR FILTER ASSEMBLY

Refer to Figure 8-32.

The bacterial air filter contains a replaceable filter cartridge (3) that is made up of 16 filter discs separated by screens. The filter discs are superfine glass wool that removes bacteria from entering air.

The purpose of the bacterial air filter is to filter incoming air. The system is exposed to contamination whenever the filter or air lines below the filter are opened. Keep these components as clean as possible when servicing.

NOTE: *Pointed end of the filter element must be installed in air inlet side.*

Remove the head assembly (5) by unscrewing the screws (1). Remove and inspect the filter cartridge (3). Clean the filter cover and body assembly by wiping with a soft cloth. Replace the filter cartridge, if necessary. Reassemble the air filter.

7.5 SOLENOID VALVES

NOTE: When installing new valves in any line, note the arrow stamped on the valve body or the words IN and OUT stamped at the inlet and outlet ports. A reversed valve cannot operate properly. To rebuild a defective valve, order the appropriate valve repair kit. The repair kit part number is found on the same parts list as the solenoid valve.

Principle of Operation

A solenoid valve is a combination of two basic functional units — (1) a solenoid (electro-magnet) with its plunger (or core); and (2) a valve containing an orifice in which a disc or plug is positioned to stop or allow flow. The valve is opened or closed by movement of the magnetic plunger (or core) which is drawn into the solenoid when the coil is energized. The solenoid valves have the solenoid mounted directly on the valve body with the solenoid core attached to the valve stem.

Direct-acting Valve (Fig. 7-2): In direct-acting valves, *the solenoid core is mechanically connected to the* valve disc and directly opens or closes the orifice, depending on whether the solenoid is energized or de-energized.

Internal pilot-operated Valve (Fig. 7-3): This valve has a pilot, a bleed orifice, and utilizes the line pressure for operation. When the solenoid is energized, it opens the pilot orifice and releases pressure from the top of the valve piston or diaphragm to the outlet side of the valve. This results in an unbalanced pressure which causes the line pressure to lift the piston or diaphragm off the main orifice, thereby opening the valve. When solenoid is de-energized the pilot orifice is closed and full line pressure is applied to the top of the piston or diaphragm through the bleed orifice, thereby providing a seating force for tight closure.

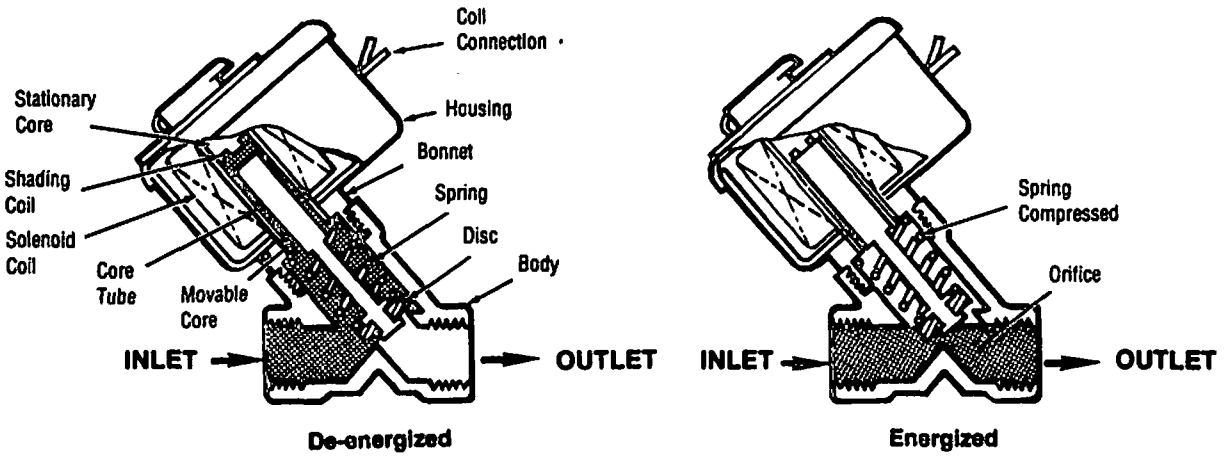


Figure 7-2. DIRECT-ACTING SOLENOID VALVE.

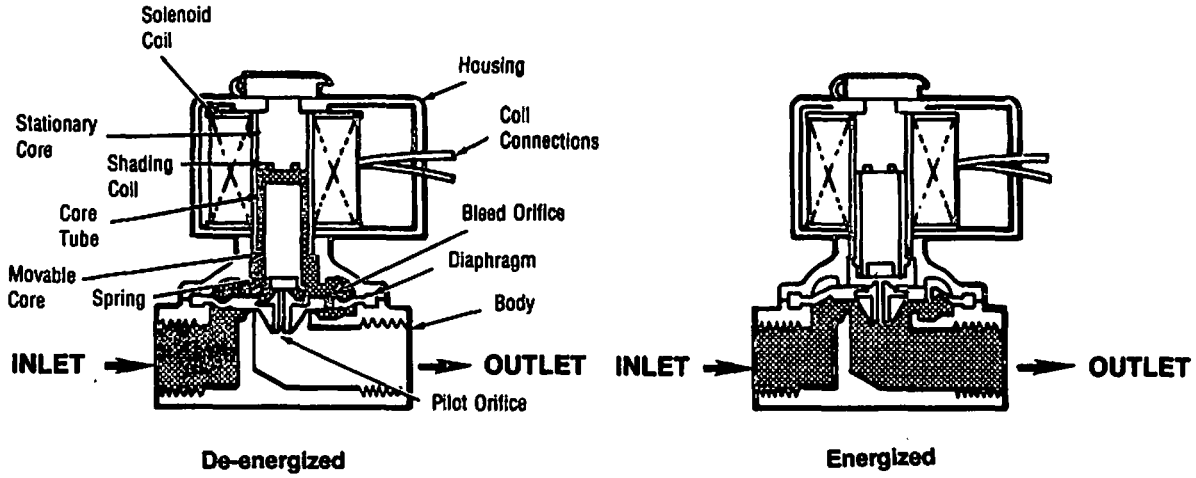


Figure 7-3. INTERNAL PILOT-OPERATED SOLENOID VALVE.

Testing

1. Energize the solenoid coil. A metallic click signifies solenoid operation. Absence of the click can indicate loss of power supply, defective coil or improper connection. Proceed as follows to correct:

a. Check voltage across the coil leads; when energized by the controller, it should be approximately 120 volts. When deenergized, it will be approximately 1 volt.

b. Check solenoid coil for open circuit or ground.

2. Energize and de-energize the coil. Check valve operation for proper opening and closing. A loud hum and sluggish operation indicate the coil is probably defective.

To replace a solenoid coil, disconnect the terminal wires and remove the top screw and cover. Lift off the coil and salvage any shim material around the pole piece. Shim must be replaced in new coil or vibration noise will occur. Slip new coil in place and shim so it fits tightly on the pole piece.

CAUTION: Solenoid valves are equipped with a special material which can be attacked by oils and grease. When replacing entire valve, wipe threads clean of cutting oils and use Teflon tape to seal pipe joints.

3. Inspect the valve for evidence of leakage. A worn valve seat will allow the valve to leak when closed. A damaged or worn seat cannot be repaired; the valve must be replaced if it leaks.

7.6 STEAM TRAP (Fig. 8-34)

CAUTION: Allow thermostatic traps to cool to room temperature before removing cover. Since there is nothing to limit expansion, the diaphragm may rupture or fatigue if trap is opened while hot.

Disassembly

1. Unscrew and remove the cap (1) and attached diaphragm assembly (3). Use a hex socket wrench to unscrew and remove seat.

2. Wipe the parts clean, taking care to avoid damaging the diaphragm, seat and pointed diaphragm stem. A very fine grade of sandpaper may be used cautiously to smooth mating surfaces of the seat and stem.

3. Wipe out the bowl (5) taking care that loose material does not enter the piping.

4. Test diaphragm for flexibility. (Unscrew from cap if necessary.) Examine solder joints for cracks or leaks; dip diaphragm in boiling water and look for a noticeable expansion. An element in good condition will be difficult to stretch by hand and will return to its original condition quickly when released. Examine the seat for wear.

Reassembly

NOTE: Use new parts as necessary. Repair kit part number is P764080-001.

1. Screw seat in firmly. (Use hex socket wrench.)

2. Replace cap and diaphragm assembly, using a new gasket.

7.7 STRAINERS

These should be opened for cleaning at least twice a year. Accumulation of sediment and rust will reduce pressure and flow. In extreme conditions, complete blockage may occur.

Disassembly

1. Remove hex plug and gasket.

2. Pull out strainer screen from body.

3. Scrape and polish all rust and residue from strainer screen and body. Use a wire brush or steel wool. Be sure that all perforations are clear, by poking open with a wire. Replace screen if damaged, rusted or corroded.

Reassembly

1. Insert screen into strainer body. Take care that no dirt or other particles remain in strainer body.

2. Replace and tighten hex plug. Use a new gasket if necessary.

3. Make certain that all pipe connections are tight after assembly.

7.8 CHECK VALVES

Repair of check valves is limited to cleaning of valve seats when foreign matter causes improper operation. When a valve becomes defective, the entire valve must be replaced.

7.9 VACUUM BREAKER (Fig. 8-27, 8)

Disassembly

1. Unscrew and remove bonnet assembly.

2. Remove friction ring and air valve seat.

3. Remove assembled ballast and float.

4. Separate ballast and float.

Clean all rust and sediment from valve. Clean out drain holes in the float and ballast, and inspect for breaks or leaks. Replace parts as required. If the friction ring and air valve seat are not in perfect condition, they should be replaced.

Reassembly

1. Assemble ballast and float.

2. Slide float/ballast assembly into valve body, making sure that the assembly moves freely in valve body.

3. Insert air valve seat and friction ring.

4. Screw on bonnet assembly.

5. Test for leaks. No water leakage at bonnet is permissible.

7.10 STEAM CONTROL VALVE, HI-LO (Fig. 8-31)

CAUTION: Handle sylphon and bellows assembly gently, to avoid damage.

Disassembly

1. Remove pilot line fitting at top of valve. Turn adjusting screw (18) counterclockwise until spring is completely free of compression. Remove screw (12) and turn entire top assembly to align lugs on bonnet and sylphon assembly (19) with notches on bottom plate. Lift top assembly off.

2. Remove 4 screws (3) which secure cover to bottom plate (13), lower spring plate (8), spring (7), and upper spring plate (6).

3. Remove 2 screws (2), reinforcement (4), and bellows assembly (5).

4. Remove cotter pin (11), pull out fork pivot pin (10), and remove fork (9).

5. Unscrew and remove sylphon and bonnet assembly (19) from valve body; also unscrew and remove valve seat (21).

6. Pull stem and disc assembly (20) from sylphon. Carefully clean valve components. Carefully examine the bellows assembly, and the sylphon and bonnet assembly for cracks. Check valve seat and valve stem assembly for etching, scratches, or other evidence of damage or leakage. Replace if worn or marred. Examine all parts for wear or damage. Replace as necessary.

Reassembly

1. Screw valve seat (21) into body. (Hex side down.)

2. Replace stem and disc (20) in sylphon (19), and screw bonnet onto body.

3. Position fork (9) on bottom plate (13). Insert pivot pin (10) and cotter pins (11).

4. Screw reinforcement (4) onto bellows, and fasten to cover with two screws (2).

5. Set lower spring plate (8), spring (7), and upper spring seat (6) in place. See that the lugs on the spring seat are properly positioned in the fork bearings.

6. Replace cover (1) and bellows (5), and secure cover with the four screws. (3)

7. Lower this entire assemblage into position over the sylphon, aligning the notches in the bottom plate with the lugs on the bonnet, to allow the bottom plate to seat on the bonnet. Replace screw (12).

8. Turn adjusting screw (18) fully counterclockwise, to remove all tension from the spring. Turn the stem protruding from the bellows to establish a clearance of 1/16 inch between the seat and the disc (Fig. 7-4). If valve was not removed from sterilizer, open side connection to see disc and seat.

9. Adjust high and low settings according to paragraph 7.15.

10. Loosen nut (25) and back out screw (26) to ensure that it does not contact adjusting fork (9). Turn adjusting screw (18) counterclockwise until minimum load with no rattle is obtained on spring.

11. Adjust screw (26) until it bottoms on fork (9). Lock in place with nut (25).

7.11 VALVE ASSEMBLY, ANGLE (Fig. 8-33)

Cleaning and Inspection

1. Open valve fully, and disconnect extension rod coupling by driving out roll pin.

2. Remove packing nut (3), gland (4), and bonnet nut (6). Remove bonnet assembly (2) from valve body and remove packing.

3. Unscrew stem (8) from bonnet. Remove disc holder (10) from stem and install new disc.

4. Examine valve seat (13) for scratches, nicks, or wear. Remove and replace if necessary. Clean and inspect all components; replace as necessary.

Reassembly

1. Lubricate stem threads with Molykote Type "U", and replace disc holder assembly on stem.

2. Screw stem into bonnet, and install new packing, forcing it into place with packing nut and gland.

3. Replace bonnet assembly on valve body, and tighten bonnet and packing nuts. Tighten only enough to prevent leakage. Excessive tightening will make valve hard to operate.

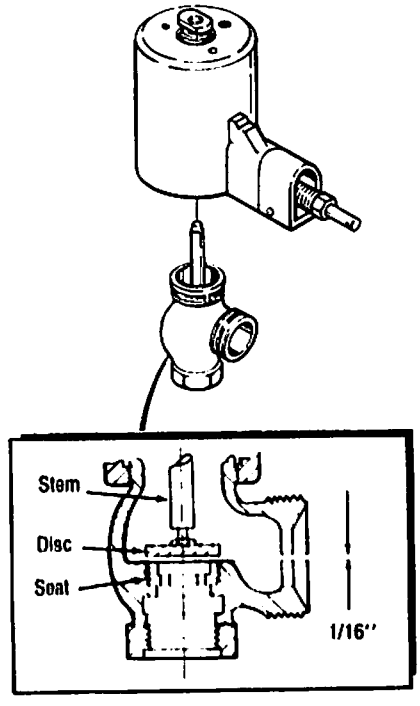


Figure 7-4. HI-LO VALVE ADJUSTMENT.

7.12 CONTROL COLUMN

The primary and secondary control panels, controller, and other components in the control column are made accessible for servicing by removing the front panel. See Figure 7-5.

1. Remove two #10-32 socket head screws from bottom of panel.

2. Open recorder door. Remove the two #8-32 button head screws thus exposed from top of panel.

3. Lift off panel and set aside. All internal components are now accessible for maintenance and servicing.

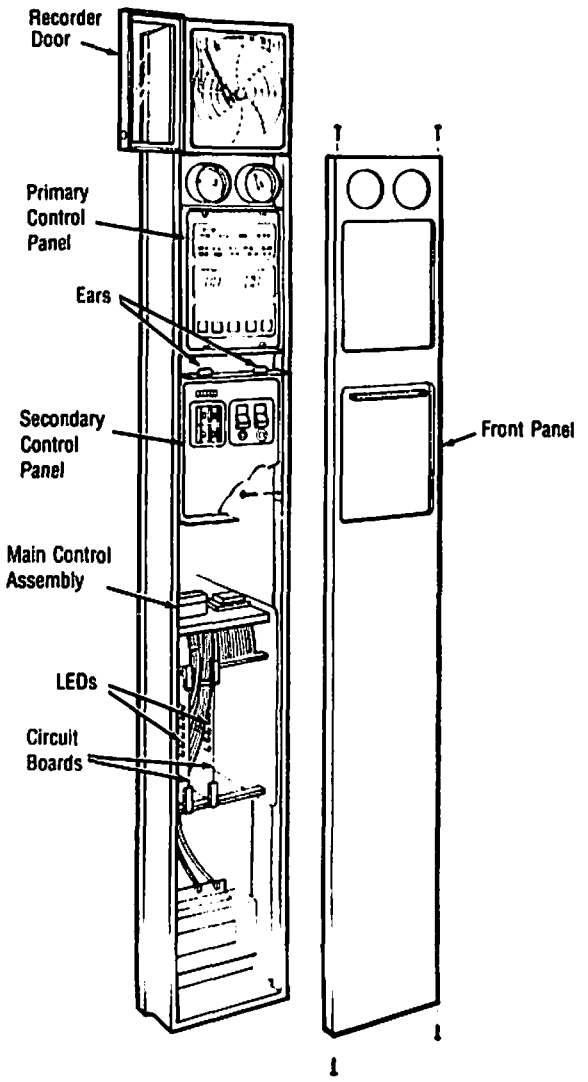


Figure 7-5. CONTROL CONSOLE.

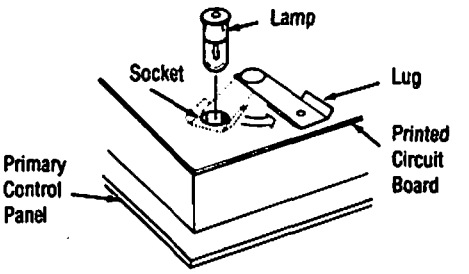


Figure 7-6. LAMP REPLACEMENT.

4. The primary control panel is held in place by four screws. Take out these screws to remove the panel for control servicing.

a. The light bulbs are removed by moving the retainer aside and lifting out the bulb. See Figure 7-6.

b. If the entire primary control is to be replaced, replacement control (Fig. 8-10, 24) must be modified for use in Vacamatic sterilizer. Do this by clipping and removing R-24, as shown in Figure 7-7.

5. The secondary control panel is held in position by two screws, located behind the panel at the bottom. Remove these screws, swing bottom of panel forward and down to disengage ears at top. Lift panel away, being careful of the wires attached thereto. The controller and its printed circuit cards are now exposed.

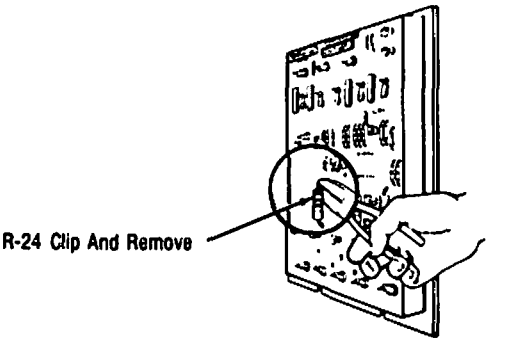


Figure 7-7. CLIP AND REMOVE R-24.

CAUTION: Use extreme care when opening a container of electronic parts. Avoid circumstances wherein a build-up of static electricity could discharge.

6. The printed circuit boards in the controller are removed by lifting the card pulls to disengage the contacts from the socket, and pulling the card straight out. See Figure 7-8. Use both card pulls simultaneously, to ensure starting the card straight. This prevents damage to the socket contacts. The controller itself is held in position by a single screw, located at the top. Unplug the two cables from controller, remove screw, and slide controller forward on its rails. For removal of Indicator-Recorder-Controller, refer to paragraph 7.2.

After replacing a printed circuit board, the following **must** be adhered to:

a. Put defective board into static-proof plastic bag in which replacement board was shipped.

b. Place plastic bag (with defective board) into replacement part shipping carton.

c. Initiate service order and enclose a copy with defective board. Include the following information:

1) reason for return (failure mode of equipment)

2) general condition of board

3) quantity

4) individual item identification (part number, serial number, etc.)

5) serial number of machine from which board was removed plus cycle count of machine.

d. Wrap shipping carton with protective wrapper or cover (envelope, paper, box, etc.).

e. Return board (and all other microprocessor parts) to AMSCO Service Company, attention: Brian Chase, Service Engineering.

This procedure must be followed to avoid inadvertent damage by static electricity.

NOTE: Static electricity is a problem because of its ability to damage printed circuit boards. If a static discharge happens to go through an integrated circuit, and the transient current pulse is not effectively diverted by protective circuitry, the current from the discharge can flow through the board and raise the temperature of internal junctions to their melting points. Damage can range from complete destruction to latent degradation.

7. The number of pulses during the Condition phase of the prevacuum cycle has been factory-set at 4. This number may be changed, within the range of 0-15, by following these steps:

a. Locate the pulse-setting hexadecimal switch on the Vacamatic printed circuit expander board (Fig. 8-15, 15). Refer to Figure 7-9 for location of the switch.

b. From the left-hand column of the pulse-setting chart, select the number of pressure/vacuum pulses you want during the conditioning phase. Then note the positions (1 = on, 0 = off) of the individual four switches for that number of pulses.

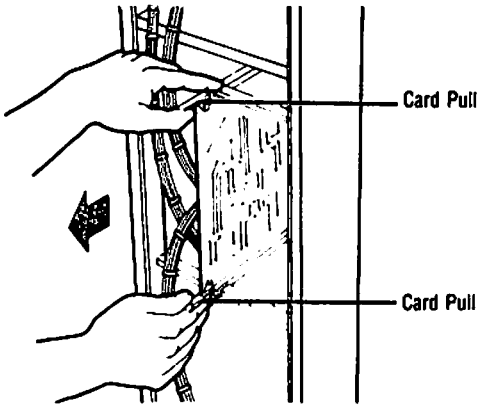
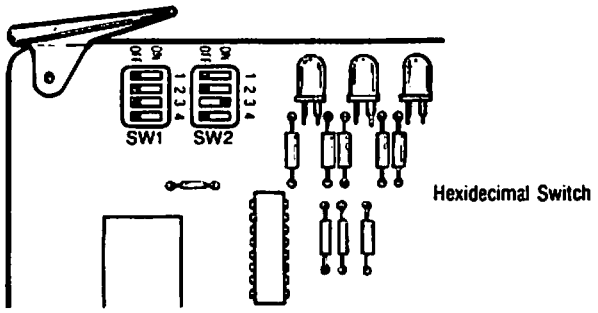


Figure 7-8. REMOVING A PRINTED CIRCUIT CARD.

c. Use a pencil or similar object to position the switches accordingly.

Example: If you wish 5 pulses, locate "5" in the left hand column under "No. of pulses desired." Reading the chart from left to right, note that switch #4 is to be positioned "off" (0 = off), switch #3 is to be positioned on (1 = on), #2 is off, #1 is on.



No. of Pulses Desired	1	2	3	4
0	0	0	0	0
1	1	0	0	0
2	0	1	0	0
3	1	1	0	0
Factory Setting ➤ 4	0	0	1	0
5	1	0	1	0
6	0	1	1	0
7	1	1	1	0
8	0	0	0	1
9	1	0	0	1
10	0	1	0	1
11	1	1	0	1
12	0	0	1	1
13	1	0	1	1
14	0	1	1	1
15	1	1	1	1

Switch No. and Position
1 = ON
0 = OFF

Pulse Setting Chart

Figure 7-9. SETTING THE PULSE SWITCH.

7.13 DOOR SWITCH (Fig. 8-21)

NOTE: Chamber door must be closed and tightened to specified torque (Table 7-1) for door to withstand maximum pressure in chamber. Door switch is on top of chamber and permits sterilizer operation only when door is locked.

Adjustment

1. Using a torque wrench on the steam lock clutch rod (Fig. 8-19, 9), close and tighten the chamber door by applying the appropriate torque specified in Table 7-1.

TABLE 7-1: TORQUE REQUIREMENTS

Sterilizer Size	Torque
16 x 26	15 foot-pounds
20 x 26	18 foot-pounds

2. Turn adjusting screw (Fig. 8-21, 1) clockwise until switch (7) is actuated. Then turn screw 1/4 turn clockwise.

3. Open door then close and tighten it by applying the specified torque.

4. Check that switch is actuated before torque applied reached specified value.

5. With switch adjusting screw properly set and door closed and tightened with specified amount of torque, start a 270° F (132° C) steam cycle.

NOTE: Do not disturb handwheel until leak test in step 6 is completed.

6. Using a metal mirror, check around door gasket for steam leaks. If door does not seal,

a. determine if chamber door has to be adjusted and

b. determine if door gasket has to be replaced because it is cracked or worn.

7. To be sure that chamber has been exhausted, do not open the chamber door until after the "end-of-cycle" buzzer stops.

7.14 ADJUSTMENT OF PRESSURE AND VACUUM SETTINGS

1. Adjust steam pressure regulator to control jacket pressure at 20 psig. After adjustment is made, lock low stop.

2. Close slow exhaust valve and then open slow exhaust valve 2.5 turns.

3. Close and lock door.

4. Set orange (top) pointer on recorder to 250° F (121° C).

5. Set sterilize time to 1 minute and dry time to 0 minutes. **NOTE:** Refer to cycle graph for liquids cycle.

6. Depress the LIQUIDS cycle button.

7. After the sterilize phase has been completed and control has advanced to slow exhaust, observe calibrated compound pressure gauge. When chamber pressure reaches 3 psig, adjust PS-3 to open the fast exhaust valve (S-3) (LED-12). When chamber exhausts to 1 psig, adjust PS-2 to turn on the COMPLETE light and the buzzer (LED-18).

8. Press RESET button on control panel and initiate another LIQUIDS cycle as in step 6.

9. When cycle advances to slow exhaust, observe the compound pressure gauge to assure setting of PS-3 at 3 psig, and PS-2 at 1 psig.

NOTE: MAKE SURE PS-3 AND PS-2 FUNCTION PROPERLY BEFORE PROCEEDING TO THE NEXT STEP.

10. Increase jacket steam pressure to approximately 24 psig.

11. Set orange (top) pointer on recorder to 270° F (132° C).

12. Set sterilize time to 1 minute and dry time to 3 minutes.

CAUTION: Because of excessive current draw, do not use an incandescent or neon type test light for the following tests.

13. Hook a digital voltmeter set to 5 volts DC or an LED test light across VS-1. (Common to normally open.) With no vacuum in the chamber, meter should read 0 volts. After 10'' vacuum is reached, meter should read 5 volts DC.

14. Depress the PREVACUUM cycle button.

15. Following a steam purge (solenoids S-4 exhaust cooling [LED-16], S-7 vacuum water [LED-14], S-2 steam to chamber [LED-13], S3 fast exhaust [LED-12], on and CONDITION light on), a vacuum will be drawn in the chamber (solenoids S-1 filtered air [LED-15], S-7 vacuum water [LED-14], S-3 fast exhaust [LED-12], on and CONDITION light on.) Adjust VS-1 to actuate at 10'' of vacuum. (Voltmeter goes from 0 volts to 5 volts.)

16. The cycle will proceed to a steam pulse phase (solenoid S-1 filtered air [LED-15], S-2 steam-to-chamber [LED-13], on and CONDITION light on). Allow chamber pressure to rise to 26 psig by adjusting the steam pressure slowly upward.

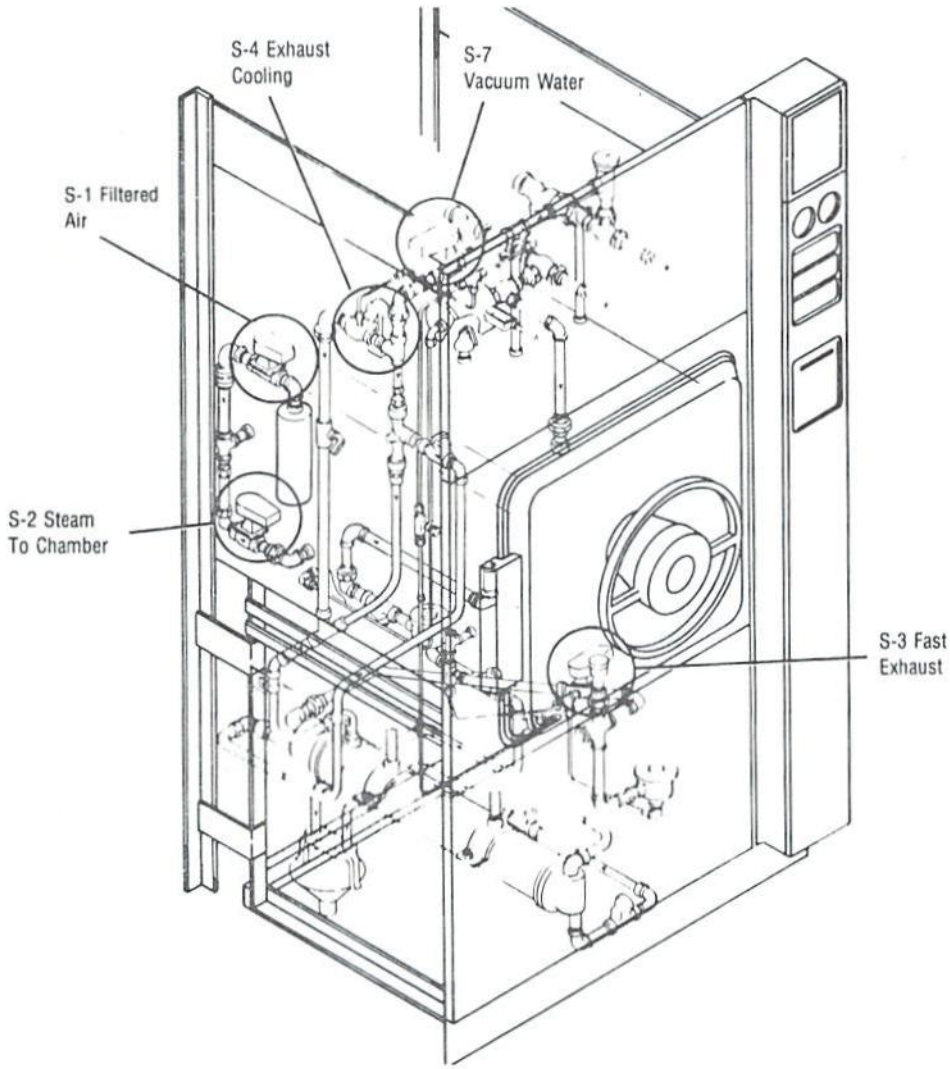


Figure 7-10. LOCATION OF SOLENOID VALVES.

17. When the chamber pressure has stabilized at 26 psig, adjust PS-1 to advance the control to the second vacuum phase.

18. Adjust the steam pressure regulator to 33 psig and set the high stop.

19. Observe the remaining vacuum/pressure pulses to assure settings of VS-1 at 10'' vacuum and PS-1 at 26 psig.

20. Refer to the pre-vacuum cycle graph. After three steam pressure pulses and four vacuums, the control will advance to the sterilize phase.

21. During the sterilize phase (solenoid S-2 steam-to-chamber [LED-13] on and STERILIZE light on), observe the control to assure temperature is controlled between 272° F and 276° F. By TS-2 in the recorder, S-2 steam-to-chamber solenoid (LED-13) will cycle on and off.

22. After the timed sterilize phase, the control will advance to the fast exhaust phase (solenoid S-4 exhaust cooling [LED-16], S-1 filtered air [LED-15], S-7 vacuum water [LED-14], S-3 fast exhaust [LED-12] and EXHAUST light are on).

23. At 3 psig the control will start the timed dry phase: solenoid S-1 filtered air (LED-15), S-7 vacuum water (LED-14), S-3 fast exhaust (LED-12) are on and EXHAUST light is on.

24. At the end of the timed dry phase, the vacuum in the chamber will break. No solenoids will be powered. The EXHAUST light will be on.

25. When the vacuum breaks to 1'' of vacuum, adjust VS-2 to bring on the COMPLETE light, the buzzer (LED-18) and the counter (LED-17).

26. Opening the door will reset the control and bring on the DOOR UNLOCKED light.

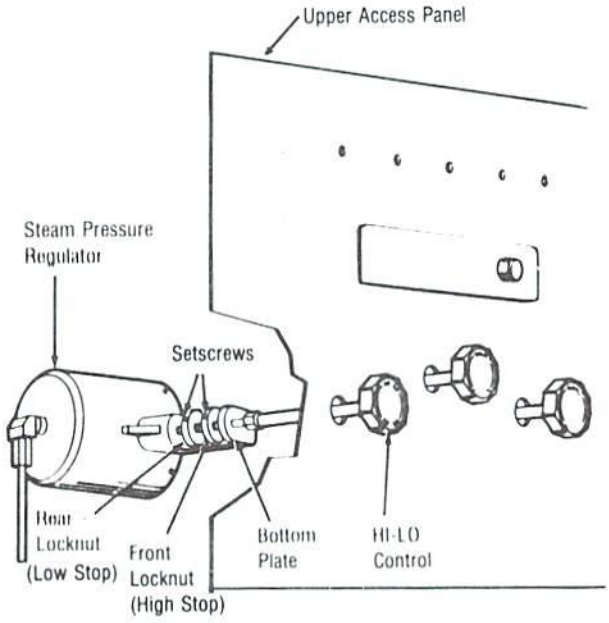


Figure 7-11. ADJUSTING PRESSURE REGULATOR

7.15 ADJUSTMENT FOR STERILIZATION BELOW 250° F (121° C)

The HI-LO valve (steam pressure regulator) on this sterilizer was factory set for 250° and 270° F (121° and 132° C) sterilization cycles. If sterilization procedures routinely require temperature control below 250° F (121° C), i.e., laboratory procedures, the LO setting may be changed. Follow the procedure below.

1. If a freestanding sterilizer, remove a cabinet side panel for access to the HI-LO valve; if a recessed model, proceed to the area behind the recessing wall.

2. Remove adjusting screw cover (Fig. 7-11).

3. Loosen setscrew on front locknut; turn locknut until it is against the rear locknut.

4. Follow instructions in paragraph 2.2, "Before Operating the Equipment."

5. Using the following chart (Fig. 7-12), adjust the HI-LO valve until jacket pressure as indicated on the jacket pressure gauge corresponds with the desired processing temperature.

6. Follow cycle instructions starting with step 3 of paragraph 2.3 if a Gravity cycle; paragraph 2.4 if a Liquids cycle, except set the yellow pointer on the indicator-recorder-controller for the desired processing temperature.

NOTE: At lower settings the indicator-recorder-controller will maintain chamber temperature at a slightly higher than set temperature ... if necessary, wait until cycle reaches the sterilize phase and readjust the yellow pointer until the recorder chart indicates the exact temperature.

7. Steps 4, 5, and 6 will have to be repeated for each new temperature. If temperature is not to be changed, turn locknut on HI-LO valve until it is against the stop on the bottom plate, then tighten the setscrew.

8. Replace the adjusting screw cover and, if applicable, the cabinet side panel.

NOTE: The jacket pressure/processing temperature relationships provided in this chart are guidelines for optimum performance of this Eagle Series sterilizer. They do not represent actual pressure/temperature ratios.

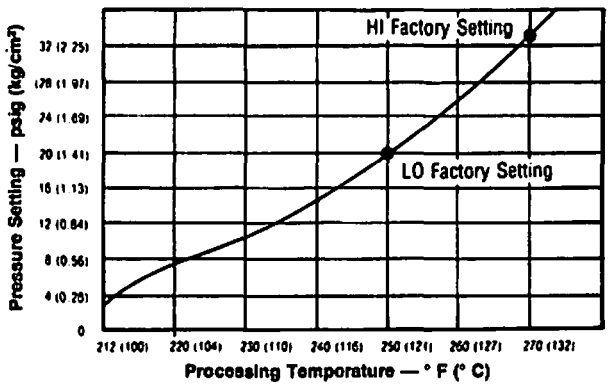
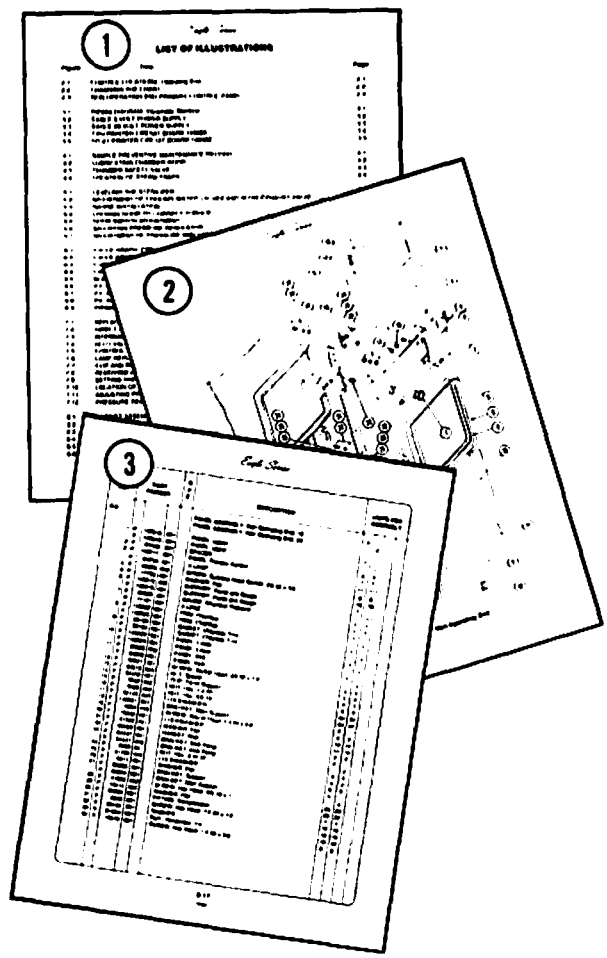


Figure 7-12. PRESSURE REGULATOR SETTINGS.

SECTION 8

EXPLODED VIEWS AND PARTS LISTS

Assemblies and components of Eagle 2000 sterilizers are illustrated and identified on the following pages. The part number, the description and the quantity required for each usage is given. Each indentation in the description represents the assembly level. The UNITS PER ASSEMBLY column is specific for the given assembly or subassembly level.



HOW TO USE THE ILLUSTRATED PARTS BREAKDOWN

(1) Determine the function and application of the part required. Turn to the List of Illustrations and select the most appropriate title. Note the illustration page number.

(2) Turn to the page indicated and locate the desired part on the illustration.

(3) From the illustration, obtain the index number assigned to the part desired. Refer to the accompanying description for specific information regarding the part.

TYPICAL INDENTATION EXAMPLE

No indentation — part of top assembly

One indentation — (1st subassembly) Part of above item with no indentation

PANEL ASSEMBLY: Non Operating End, 16" .....
PANEL ASSEMBLY: Non Operating End, 20" .....

PANEL, Upper .....
PANEL, Upper .....
SPACER .....
PANEL, Primary Control .....
• LAMP .....
SCREW, Buttress Head Socket, #8-32 x 3/8 .....
WASHER, Flat .....

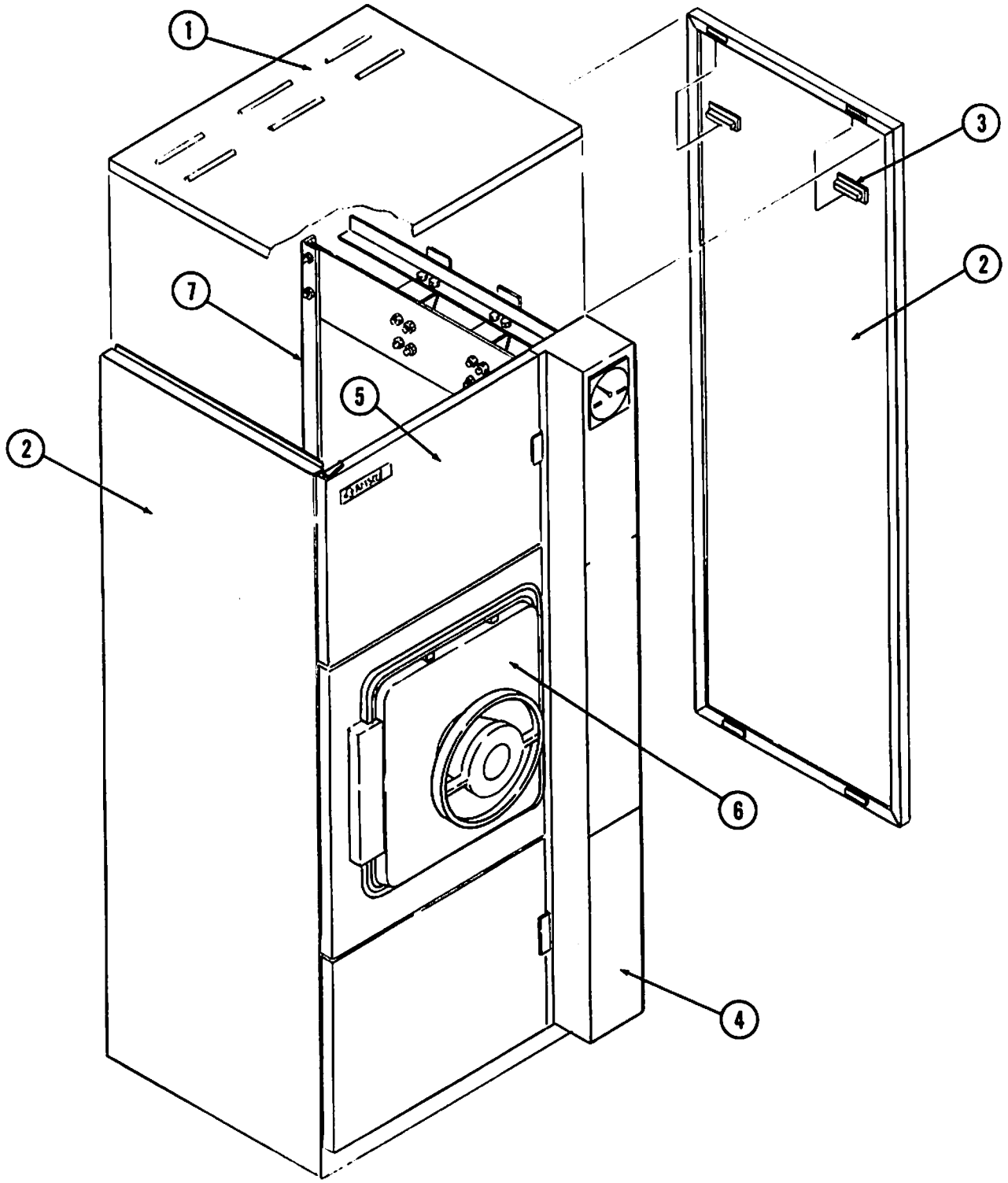


Figure 8-1. CABINET ASSEMBLY: Freestanding Sterilizer.

FIG. & INDEX NO.		PART NUMBER		S V C	DESCRIPTION	UNITS PER ASSEMBLY			
8-1-					CABINET ASSEMBLY: 16" Single Door, Freestanding	X			
					CABINET ASSEMBLY: 20" Single Door, Freestanding		X		
	1	P	136422	002	PANEL, Top	1			
		P	136423	002	PANEL, Top		1		
	2	P	93404	003	PANEL, Side	2			
		P	93404	004	PANEL, Side		2		
	3	P	84298	001	CATCH, Magnetic	8	8		
	4				CONTROL ASSEMBLY (See Fig. 8-10)	1	1		
	5				PANEL ASSEMBLY, Operating End (See Fig. 8-6)	1	1		
	6				COVER AND HANDWHEEL ASSEMBLY (See Fig. 8-18)	1	1		
	7				SIDE FRAME ASSEMBLY (See Fig. 8-2)	1	1		

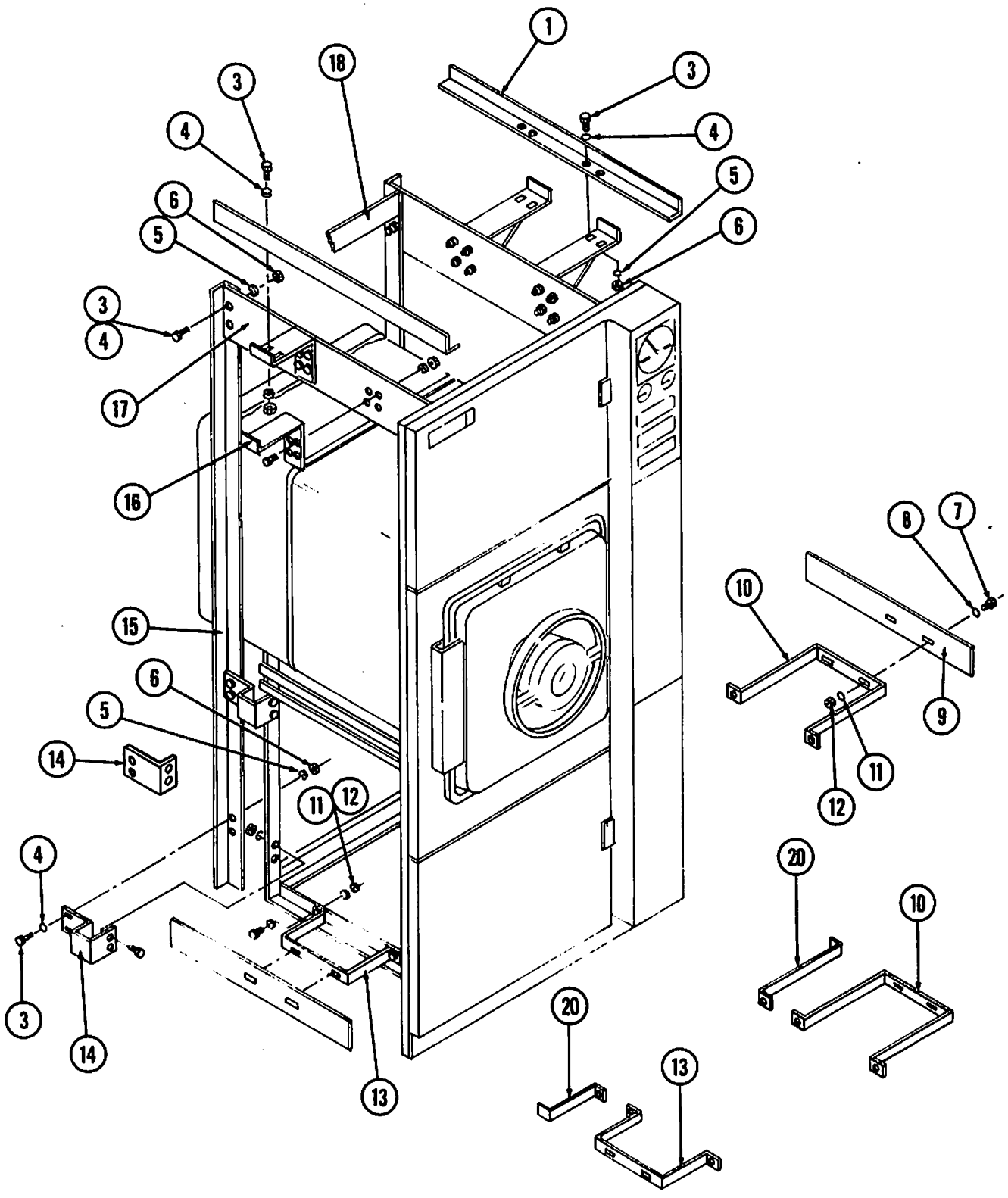


Figure 8-2. SIDE FRAME ASSEMBLY: Freestanding Sterilizer.

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY			
8-2-					SIDE FRAME ASSEMBLY: 16" Single Door, Freestanding	X			
					SIDE FRAME ASSEMBLY: 20" Single Door, Freestanding		X		
1	P	93390	001		SUPPORT, Top Panel	2			
	P	93390	002		SUPPORT, Top Panel		2		
2					NOT USED	—	—		
3	P	3848	051		SCREW, Hex Head, 1/4-20 x 3/4	32	32		
4	P	3515	041		WASHER, Flat, 1/4	32	44		
5	P	76230	091		LOCKWASHER, 1/4	32	44		
6	P	3097	041		NUT, 1/4-20	32	44		
7	P	31838	042		SCREW, Hex Head, 3/8-16 x 1	10	10		
8	P	10414	042		WASHER, 3/8	10	10		
9	P	93663	001		SUPPORT, Bottom	2			
	P	93663	002		SUPPORT, Bottom		2		
10	P	93665	002		BRACKET, Bottom, Long	1			
	P	93398	002		BRACKET, Bottom, Long		1		
11	P	89809	061		LOCKWASHER, Stainless Steel, Internal Tooth	10	10		
12	P	3099	042		NUT, 3/8-16	10	10		
13	P	93665	001		BRACKET, Bottom, Short	1			
	P	93398	001		BRACKET, Bottom, Short		1		
14	P	93688	001		BRACKET, Main Support	4			
	P	93664	001		BRACKET, Main Support		4		
15	P	146628	001		SUPPORT, Rear Cabinet	2	2		
16	P	93388	001		HANGER ASSEMBLY, Short	2	2		
17	P	93667	001		SUPPORT, Top Attachment	2			
	P	93667	002		SUPPORT, Top Attachment		2		
18	P	93668	001		BRACKET, Top Attachment	1			
	P	93669	001		BRACKET, Top Attachment		1		
19	P	93395	001		HANGER ASSEMBLY, Long	2	2		
20	P	93399	001		BRACE, Bottom, Short		1		
	P	93399	002		BRACE, Bottom, Long		1		

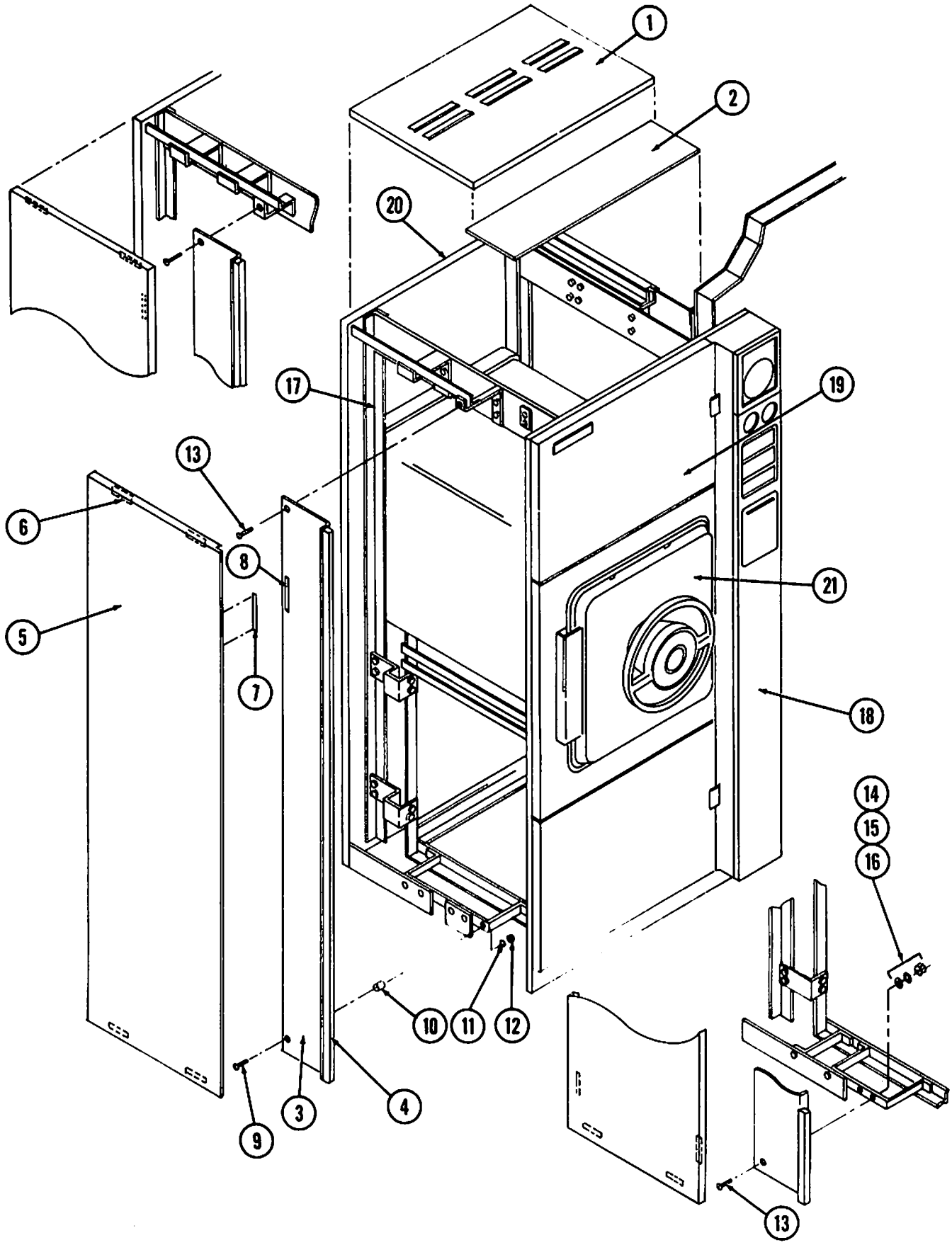


Figure 8-3. CABINET ASSEMBLY: Double Door, Recessed.

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY			
8-3-					CABINET ASSEMBLY: 16" Double Door, Recessed	X			
					CABINET ASSEMBLY: 20" Double Door, Recessed		X		
1	P	136422	001		PANEL, Top	1			
	P	136423	001		PANEL, Top		1		
2	P	93415	001		FILLER	1			
	P	93415	002		FILLER		1		
3	P	93401	001		PANEL, Extension	2			
	P	93401	002		PANEL, Extension		2		
4	P	84297	001		STRIP, Sponge	2	2		
5	P	93404	001		PANEL, Side	2			
	P	146339	014		PANEL, Side		2		
6	P	84298	001		CATCH, Magnetic	8	20		
7	P	129340	001		†TAPE, Velcro, Wool Type	2			
8	P	129340	002		†TAPE, Velcro, Hook Type	2			
9	P	38675	041		SCREW, Flat Head, 10-32 x 1-3/4	2			
10	P	129341	001		SPACER	2			
11	P	19677	041		LOCKWASHER, #10	2			
12	P	2960	042		NUT, 10-32	2			
13	P	42656	091		SCREW, Flat Head, 1/4-20 x 1	2	4		
14	P	76230	091		LOCKWASHER, 1/4	2	4		
15	P	3097	041		NUT, 1/4-20	2	4		
16	P	3515	041		WASHER, Flat, 1/4	2	4		
17					SIDE FRAME ASSEMBLY (See Fig. 8-4)	1	1		
18					CONTROL ASSEMBLY (See Fig. 8-10)	1	1		
19					PANEL ASSEMBLY, Operating End (See Fig. 8-5)	1	1		
20					PANEL ASSEMBLY, Non-Operating End (See Fig. 8-8)	1	1		
21					COVER AND HANDWHEEL ASSEMBLY (See Fig. 8-18)	2	2		

†Secure Velcro fasteners to panels with Loctite Super Bonder 495 or equivalent.

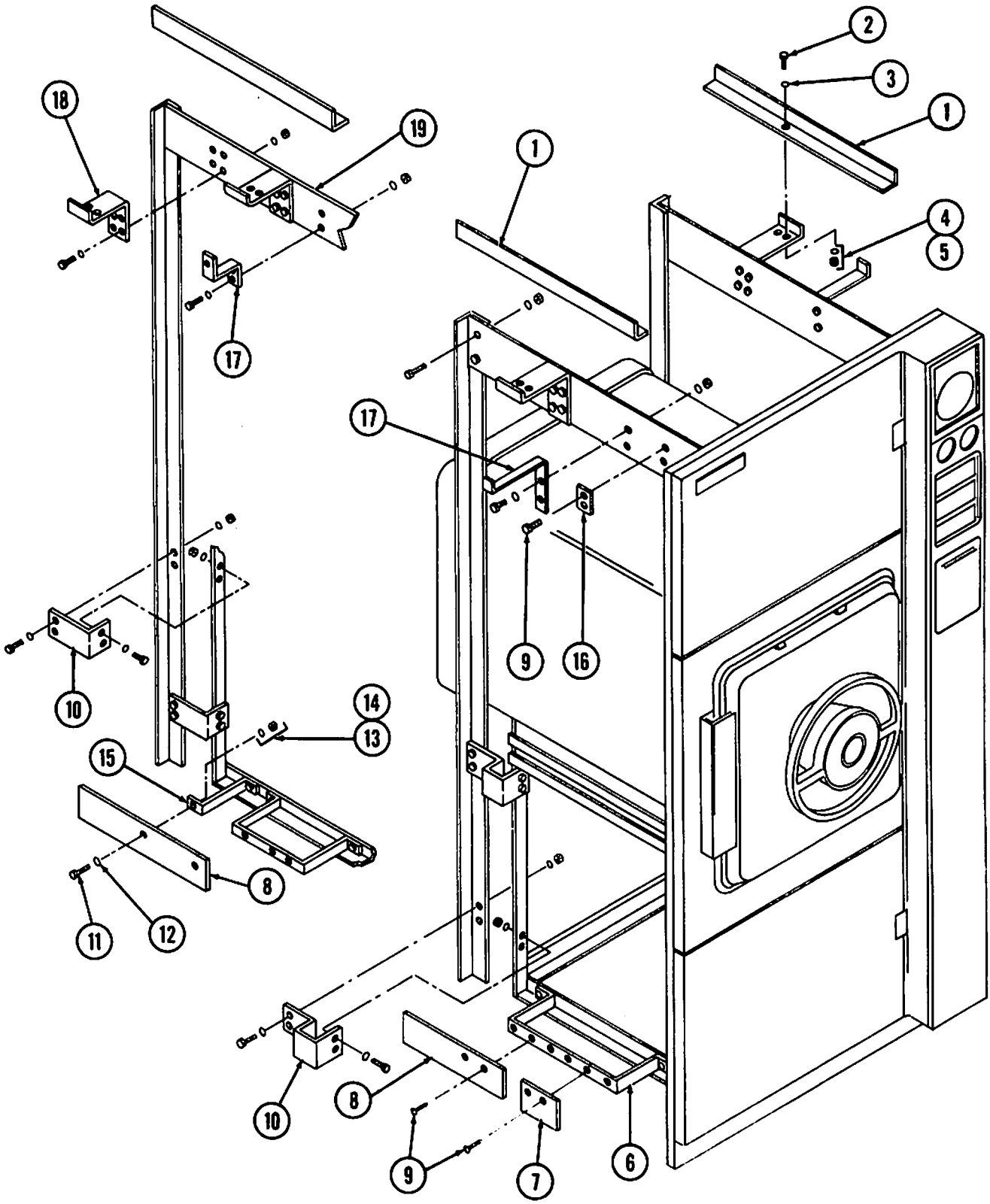


Figure 8-4. SIDE FRAME ASSEMBLY: Recessed Sterilizer.

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY			
8-4-					SIDE FRAME ASSEMBLY: 16'' Double Door, Recessed	X			
					SIDE FRAME ASSEMBLY: 20'' Double Door, Recessed		X		
1	P	93389	001		SUPPORT, Top Panel	2			
	P	93391	001		SUPPORT, Top Panel		2		
2	P	3848	051		SCREW, Hex Head, 1/4-20 x 3/4	32	32		
3	P	3515	041		WASHER, Flat, 1/4	32	32		
4	P	76230	091		LOCKWASHER, 1/4	32	32		
5	P	3097	041		NUT, Hex, 1/4-20	32	32		
6	P	93666	001		BRACKET, Bottom	2	32		
	P	93398	001		BRACKET, Bottom		2		
7	P	84470	001		PLATE, Strike	2			
8	P	84471	001		PLATE, Strike	2			
	P	93663	003		SUPPORT, Bottom		2		
9	P	43341	091		SCREW, Flat Head, #8-32 x 1/2	16	8		
10	P	93688	001		BRACKET, Main Support	4			
	P	93664	001		BRACKET, Main Support		4		
11	P	31838	042		SCREW, Hex Head Cap, 3/8-16 x 1	10	10		
12	P	10414	042		WASHER, Flat	10	10		
13	P	89809	061		LOCKWASHER, Stainless, Internal Tooth Type	10	10		
14	P	3099	042		NUT, Hex, 3/8-16	10	10		
15	P	93399	001		BRACE, Bottom		2		
16	P	84469	001		PLATE, Strike	4	4		
17	P	84075	001		BRACKET, Top	2			
	P	84075	003		BRACKET, Top		2		
18	P	93388	001		HANGER, Top	2	4		
19	P	93397	001		SUPPORT, Top Plate	2			
	P	93392	001		SUPPORT, Top Plate		2		

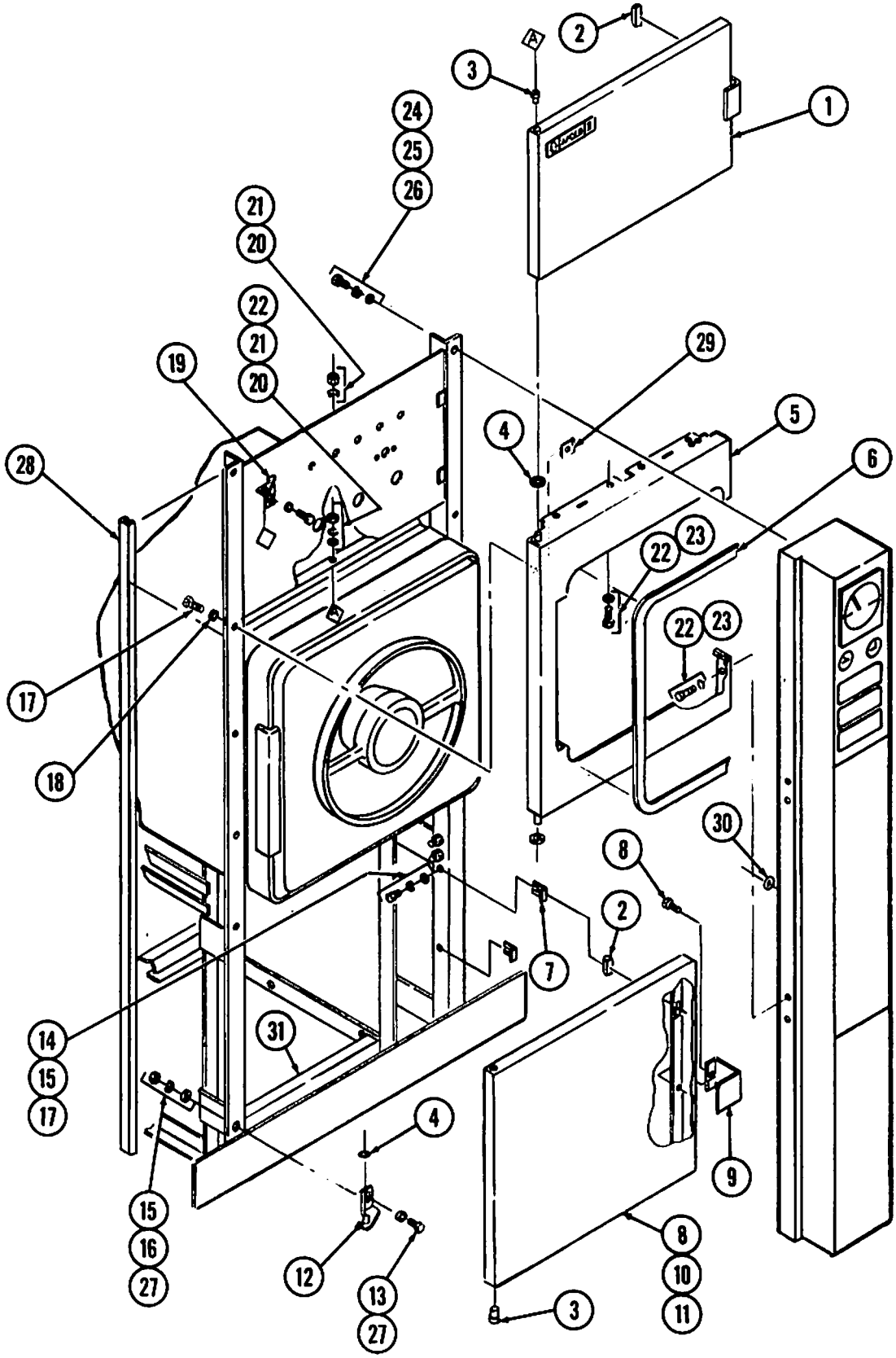


Figure 8-5. PANEL ASSEMBLY: Operating End.

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY			
8-5-					PANEL ASSEMBLY: Operating End, 16''	X			
					PANEL ASSEMBLY: Operating End, 20''		X		
1	P	143146	002		PANEL ASSEMBLY, Upper Access	1			
	P	143146	001		PANEL ASSEMBLY, Upper Access		1		
2	P	83920	001		CATCH, Magnetic	4	4		
3	P	84455	001		BEARING, Flange	4	4		
4	P	84457	001		WASHER	2	2		
5	P	143149	001		TRIM, Shell	1			
	P	143148	001		TRIM, Shell		1		
6	P	90183	091		GASKET, Chamber Trim	1			
	P	90184	091		GASKET, Chamber Trim		1		
7	P	93702	001		STRIKE	4	4		
8	P	91620	061		SCREW, Self Tap, #10-32 x 3/8	8	8		
9	P	93095	001		HANDLE	2	2		
10	P	136302	002		PANEL, Lower Access	1			
	P	136302	001		PANEL, Lower Access		1		
11	P	93096	001		RACK, Manual (Not Shown)	1	1		
12	P	93701	001		HINGE ASSEMBLY	1	1		
13	P	10572	061		SCREW, Hex Head, 1/4-20 x 5/8	4	4		
14	P	49134	061		WASHER, Flat	17	17		
15	P	19678	045		LOCKWASHER	18	18		
16	P	3097	041		NUT, Hex, 1/4-20	8	8		
17	P	3846	041		SCREW, Hex Head, 1/4-20 x 1/2	11	11		
18	P	17589	045		WASHER, Flat	9	9		
19	P	93701	002		HINGE ASSEMBLY	1	1		
20	P	2960	042		NUT, Hex, #10-32	14	14		
21	P	19677	041		LOCKWASHER	14	14		
22	P	5511	041		WASHER, Flat	14	14		
23	P	41012	061		SCREW, Socket Head Cap, #10-32 x 1/2	12	12		
24	P	3857	045		SCREW, Hex Head Cap, 3/8-16 x 1/2	5	5		
25	P	25832	041		LOCKWASHER	5	5		
26	P	10456	091		WASHER, Shim, 11/16 x 25/32 x 1/32	5	5		
27	P	10445	091		WASHER, Flat	4	4		
28	P	93089	001		GASKET, Wall	1	1		
29	P	91924	091		NUT, Tinnerman	5	5		
30	P	43754	045		WASHER	1	1		
31	P	13679	001		STABILIZER (Not Shown)	1			
	P	13679	002		STABILIZER (Not Shown)		1		

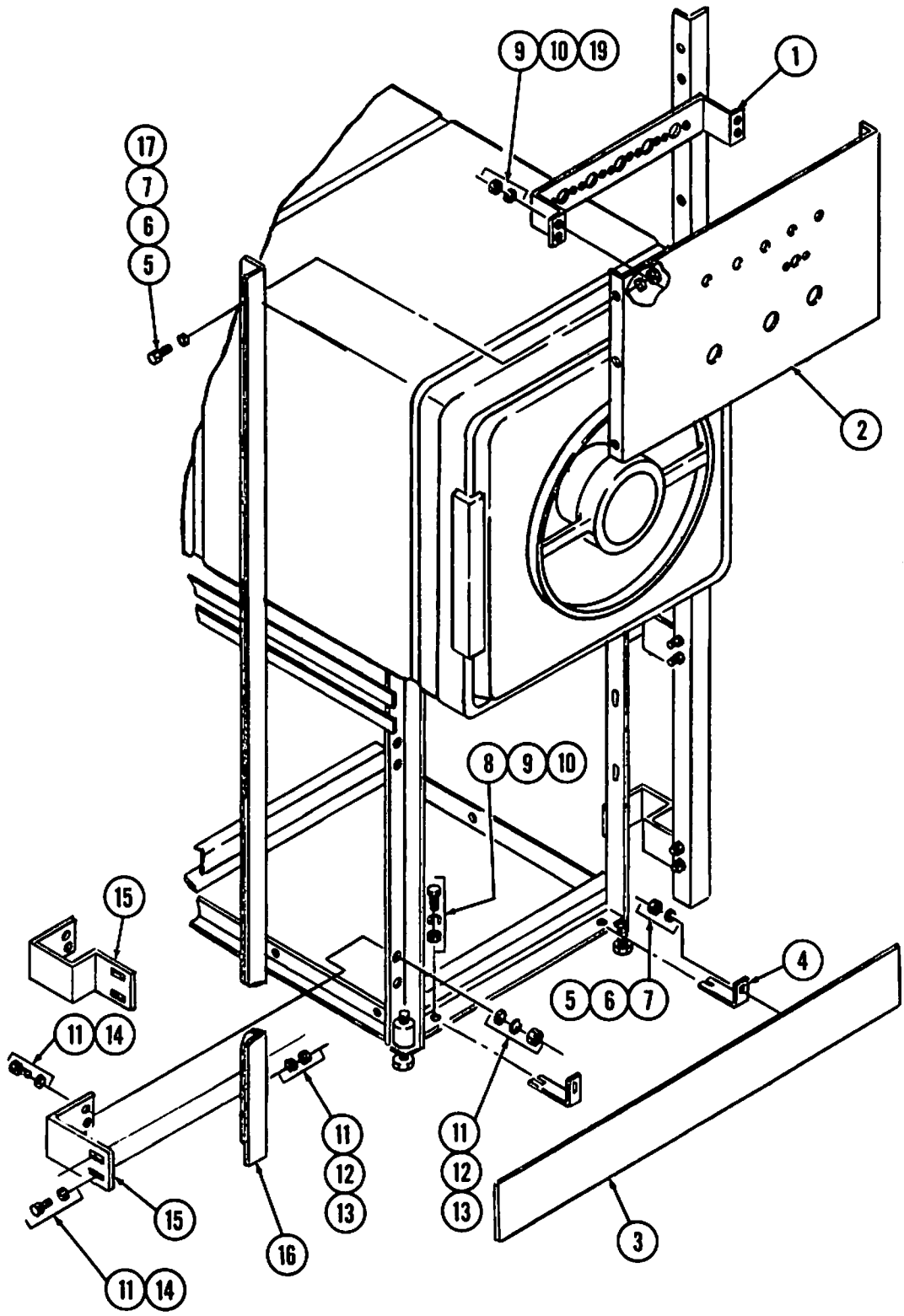


Figure 8-6. SUB PANELS: Operating End.

FIG. & INDEX NO.	PART NUMBER		SVC	DESCRIPTION	UNITS PER ASSEMBLY			
8-6-				SUB PANELS: Operating End, 16''	X			
				SUB PANELS: Operating End, 20''		X		
1	P	93092	001	SUPPORT, Switch	1	1		
2	P	146153	002	PANEL ASSEMBLY, Valve	1			
	P	146153	001	PANEL ASSEMBLY, Valve		1		
3	P	93084	002	PANEL, Kick	1			
	P	93084	001	PANEL, Kick		1		
4	P	84437	002	BRACKET, Kick Panel	2	2		
5	P	2960	042	NUT, Hex, #10-32	2	2		
6	P	19677	041	LOCKWASHER	2	2		
7	P	5511	041	WASHER, Flat	2	2		
8	P	3846	041	SCREW, Hex Head Cap, 1/4-20 x 1/2	2	2		
9	P	19678	045	LOCKWASHER	2	2		
10	P	10445	091	WASHER, Flat	2	2		
11	P	10456	091	WASHER, Shim 11/16 x 25/64 x 1/32	16	16		
12	P	19680	041	LOCKWASHER	16	16		
13	P	3099	042	NUT, Hex, 3/8-16	16	16		
14	P	31838	042	SCREW, Hex Head Machine, 3/8-16 x 1	16	16		
15	P	93688	002	BRACKET, Support	4			
	P	93664	001	BRACKET		4		
16	P	143145	001	BRACKET, R.H.	1	1		
	P	143145	002	BRACKET, L.H.	1	1		
17	P	41012	061	SCREW, Socket Head Cap, #10-32 x 1/2	6	6		
18	P	17589	045	WASHER, Flat	6	6		
19	P	3097	041	NUT, Hex, 1/4-20	8	8		

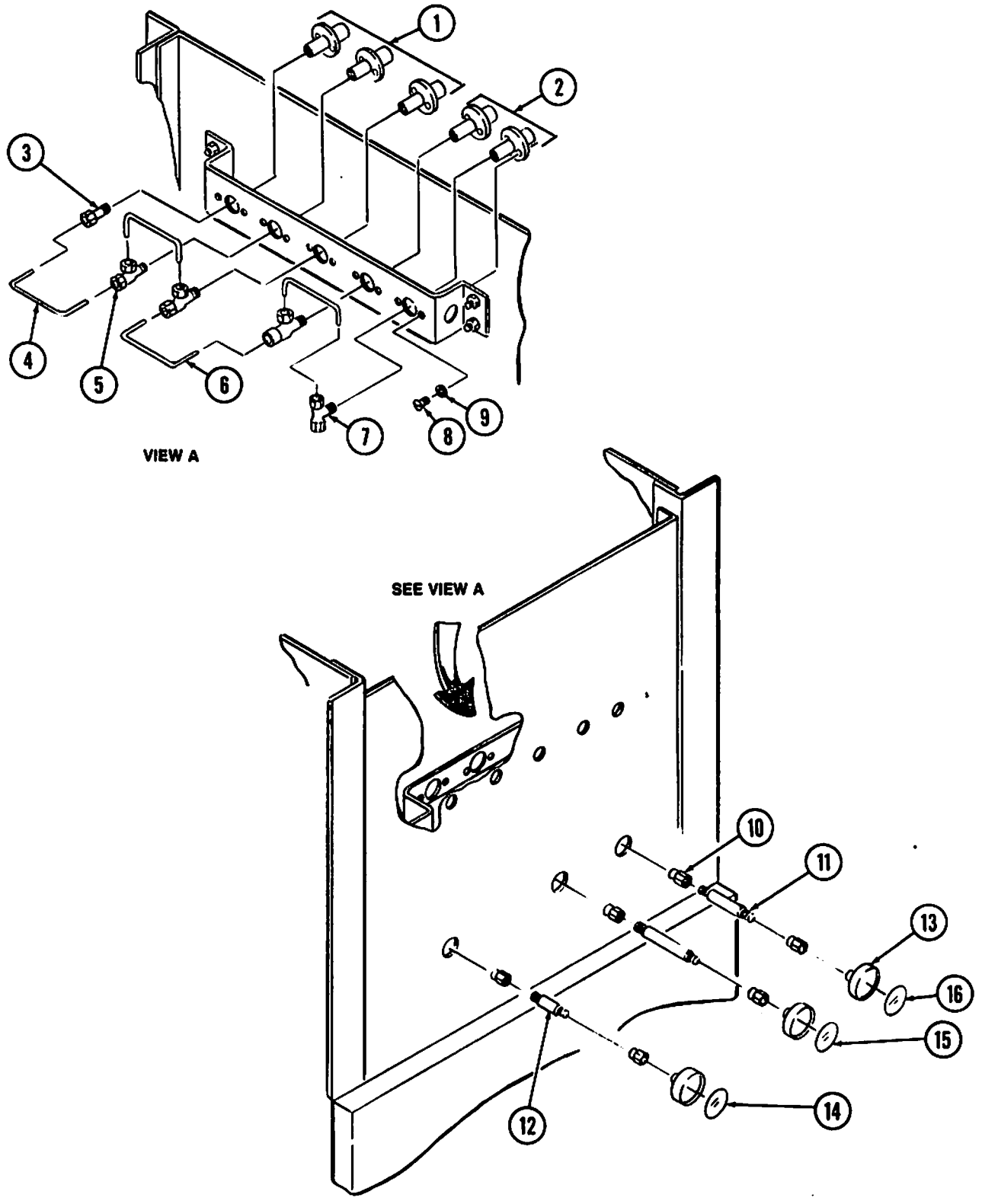


Figure 8-7. TOP CONTROL PANEL: Operating End.

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-7-					TOP CONTROL PANEL: Operating End	X
1	P	83865	001		SWITCH, Pressure	3
2	P	83866	001		SWITCH, Vacuum	2
3	P	43289	091		FITTING, Compression, 1/4 O.D.T. x 1/8 N.P.T.	1
4	P	83888	001		TUBE	1
5	P	78285	091		TEE, Male Run	3
6	P	83887	001		TUBE	3
7	P	42581	091		FITTING, Tube	1
8	P	3984	041		SCREW, #6-32 x 3/8	10
9	P	5469	041		WASHER, Flat	10
10	P	8605	042		NUT, Valve	6
11	P	51999	043		ROD, Extension	2
12	P	83869	001		ROD, Extension	1
13	P	54899	091		KNOB, Valve	3
14	P	90576	091		DECAL, Steam Pressure, HI LO	1
15	P	90322	091		DECAL, Steam Supply	1
16	P	90323	091		DECAL, Water Supply	1

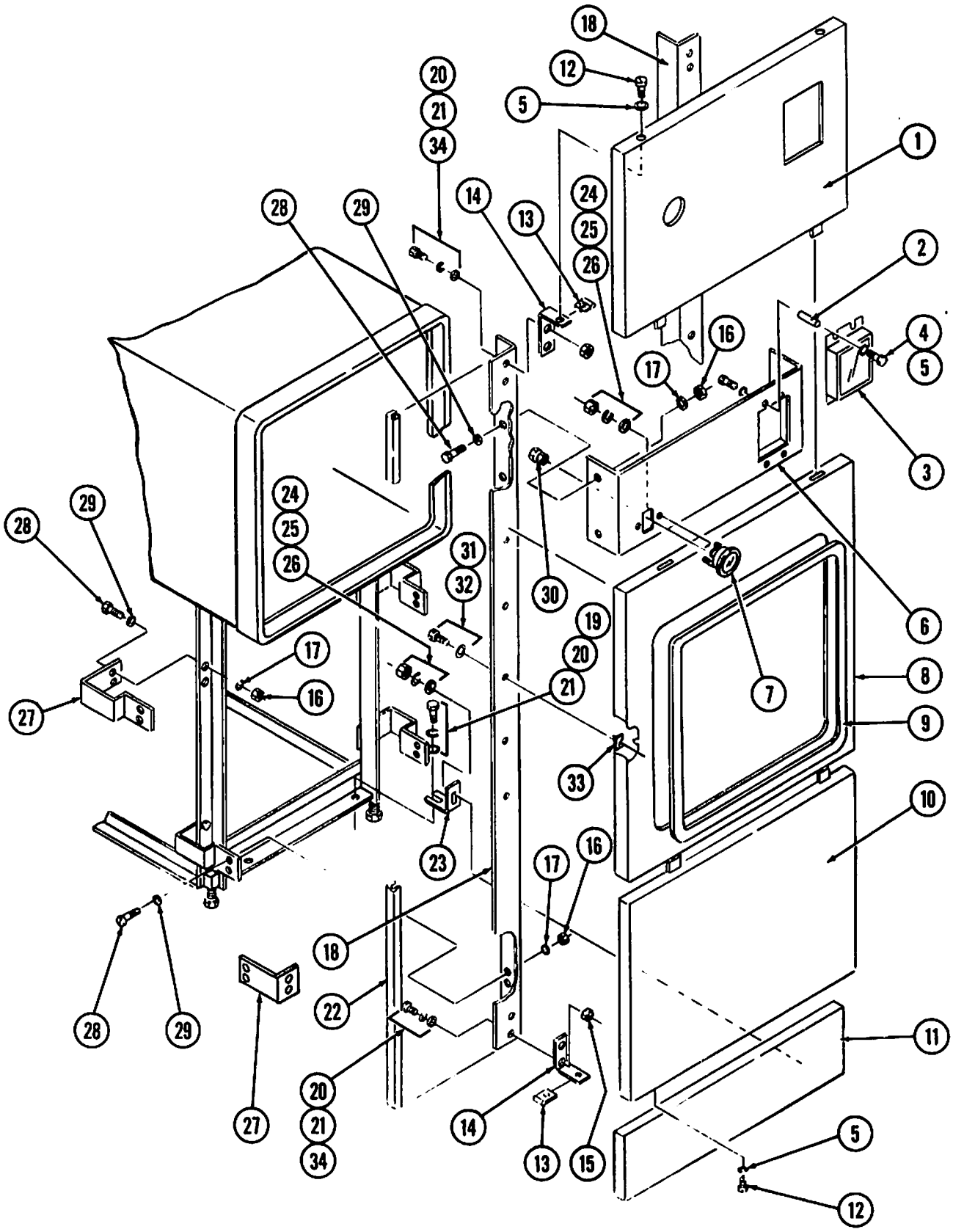


Figure 8-8: PANEL ASSEMBLY : Non-Operating End.

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY			
8-8-					PANEL ASSEMBLY: Non Operating End, 16''	X			
					PANEL ASSEMBLY: Non Operating End, 20''		X		
1	P	146518	001		PANEL, Upper	1			
	P	146519	001		PANEL, Upper		1		
2	P	84438	001		SPACER	4	4		
3	P	146517	001		PANEL, Primary Control	1	1		
	P	84233	001		• LAMP	11	11		
4	P	45323	042		SCREW, Buttress Head Socket, #8-32 x 3/8	8	8		
5	P	17796	091		WASHER, Flat	16	16		
6	P	146516	002		SUPPORT, Panel and Gauge	1			
	P	146516	001		SUPPORT, Panel and Gauge		1		
7	P	90525	091		GAUGE, Chamber Pressure	1	1		
	P	77121	091		• LENS	1	1		
8	P	146522	001		TRIM, Chamber	1			
	P	146525	001		TRIM, Chamber		1		
9	P	90183	091		GASKET, Chamber Trim	1			
	P	90184	091		GASKET, Chamber Trim		1		
10	P	146520	001		PANEL, Lower	1			
	P	146523	001		PANEL, Lower		1		
11	P	93689	002		PANEL, Kick	1			
	P	93689	001		PANEL, Kick		1		
12	P	50527	061		SCREW, Socket Head, #8-32 x 1/2	4	4		
13	P	90918	045		NUT, Speed	4	4		
14	P	84436	001		CLIP, Panel Support	4	4		
15	P	3040	042		NUT, Hex, 1/4-20	8	8		
16	P	3099	042		NUT, Hex, 3/8-16	20	20		
17	P	52149	045		LOCKWASHER	20	20		
18	P	146527	001		BRACKET, Main Support	2			
19	P	3950	048		SCREW, Round Head, 1/4-20 x 5/8	2	2		
20	P	76230	091		LOCKWASHER	10	10		
21	P	31599	041		WASHER, Flat	10	10		
22	P	93089	001		GASKET, Wall	2	2		
23	P	84437	001		BRACKET, Kick Panel	2			
	P	84437	002		BRACKET, Kick Panel		2		
24	P	2959	041		NUT, Hex, #10-32	4	4		
25	P	31705	045		LOCKWASHER	4	4		
26	P	5511	091		WASHER, Flat	6	6		
27	P	93688	001		BRACKET, Support	4			
	P	93664	001		BRACKET, Main Support		4		
28	P	31838	042		SCREW, Hex Head, 3/8-16 x 1	20	20		
29	P	10414	042		WASHER, Flat	20	20		
30	P	90594	091		FITTING, Compression	1	1		
31	P	3846	061		SCREW, Hex Head, 1/4-20 x 1/2	10	10		
32	P	49134	061		WASHER	10	10		
33	P	91924	091		NUT, Tinnerman, 1/4	10	10		
34	P	10572	061		SCREW, Hex Head, 1/4-20 x 5/8	8	8		

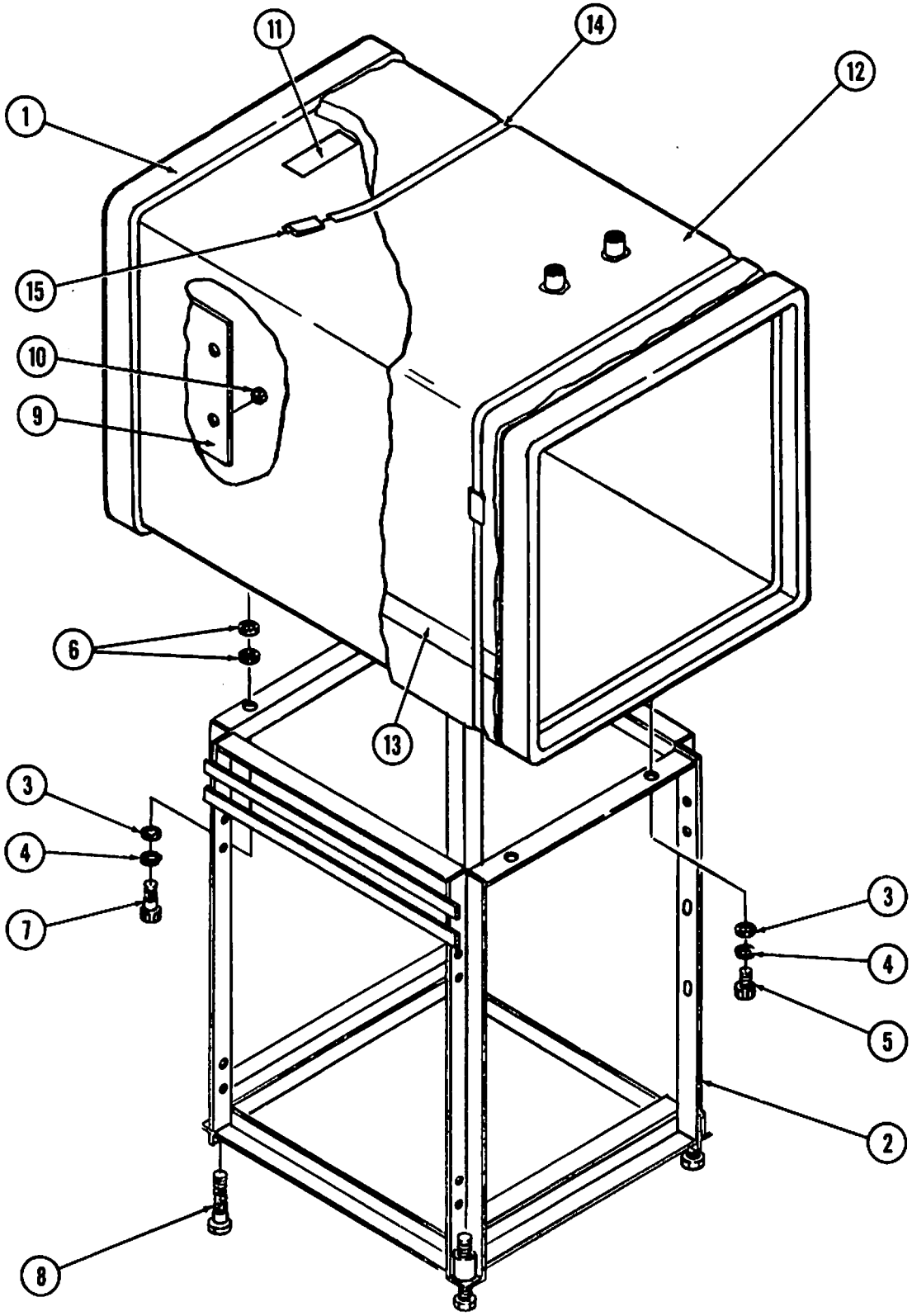


Figure 8-9. SHELL AND STAND ASSEMBLY.

FIG. & INDEX NO.	PART NUMBER		SVC	DESCRIPTION	UNITS PER ASSEMBLY	
8-9-				SHELL AND STAND ASSEMBLY: 16 x 16 Sterilizer	X	
				SHELL AND STAND ASSEMBLY: 20x20 Sterilizer		X
1	P	136587 007		SHELL, Weldment, Single Door	1	
	P	136587 001		SHELL, Weldment, Single Door		1
	P	136587 008		SHELL, Weldment, Double Door	1	
	P	136587 002		SHELL, Weldment, Double Door		1
2	P	136435 001		STAND, Weldment	1	
	P	136435 002		STAND, Weldment		1
3	P	5503 045		WASHER, Flat, 1 O.D. x 13/32 I.D. x 3/32 THK	4	8
4	P	19687 061		WASHER, Lock (3/8)	4	4
5	P	12439 045		SCREW, Socket Head 3/8-16 UNC x 3/4	2	2
6	P	90441 045		WASHER, Flat, 1 O.D. x 13/32 I.D. x 1/8 THK	2	—
7	P	16383 045		SCREW, Socket Head, 3/8-16 UNC x 1	2	2
8	P	90407 045		SCREW, Square Head, 5/8-11 UNC x 4-1/2	4	4
9	P	93293 001		BAFFLE, Steam	1	1
10	P	150231 001		NUT, Hex, 1/4-20 UNC	4	4
11	P	90542 091		NAMEPLATE	1	1
12				INSULATION	1	1
13				TAPE	1	1
14				STRAP	2	2
15	P	32268 091		SEAL, Strap	2	2

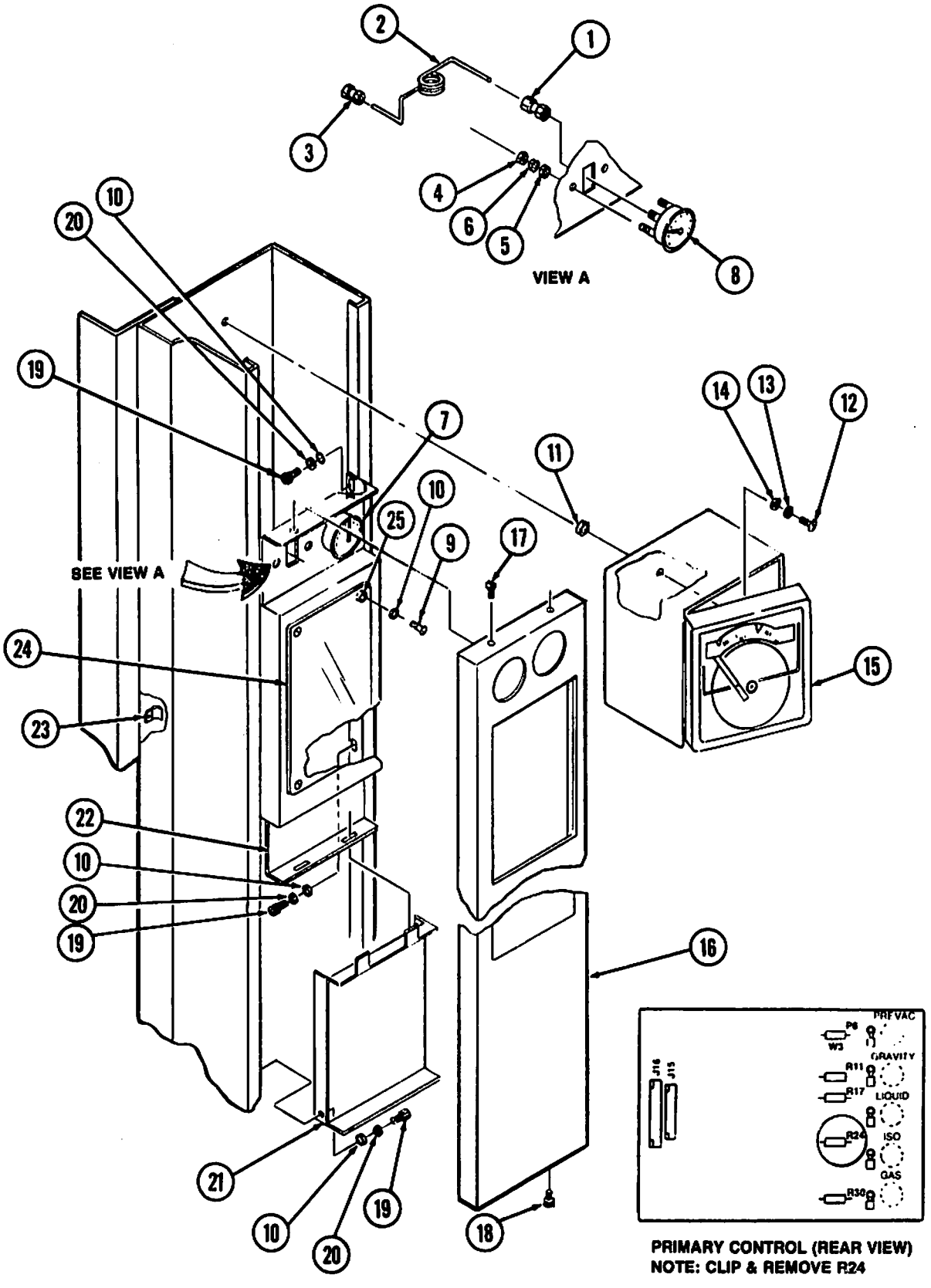


Figure 8-10. CONTROL COLUMN (Part 1 of 3).

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-10-					CONTROL COLUMN (Part 1 of 3)	
1	P	90594	091		COUPLING, Compression, 1/8 O.D.T. x 1/8 N.P.T.	2
2	P	89053	091		TUBING, 1/8 O.D. x 40	1
3	P	129276	001		FITTING, Bulkhead, 1/8 O.D.T.	2
4	P	2959	041		NUT, Hex, #10-32	4
5	P	31705	045		LOCKWASHER	4
6	P	5511	091		WASHER, Flat	4
7	P	90525	091		GAUGE, Chamber Pressure	1
	P	77121	091		• LENS	1
8	P	90530	091		GAUGE, Jacket Pressure	1
	P	77121	091		• LENS	1
9	P	78025	042		SCREW, Button Head Socket, #8-32 x 7/8	4
10	P	17796	091		WASHER, Flat	10
11	P	84391	001		SPACER, Recorder	2
12	P	4001	041		SCREW, Round Head, 1/4-20 x 7/8	2
13	P	26962	061		LOCKWASHER	2
14	P	31599	041		WASHER, Flat	2
15	P	83518	001		RECORDER (See Fig. 8-13)	1
16	P	146483	002		FRONT PANEL ASSEMBLY	1
17	P	45323	042		SCREW, Button Head Socket, #8-32 x 3/8	2
18	P	24341	041		SCREW, Socket Head Cap, #10-32 x 3/8	2
19	P	50527	061		SCREW, Socket Head Cap, #8-32 x 1/2	6
20	P	79588	001		LOCKWASHER	6
21	P	146490	001		PANEL, Secondary Assembly (See Fig. 8-16)	1
22	P	146484	001		PANEL, Mounting	1
23	P	451283	001		CLIP, Locking, Capillary	3
24	P	146163	001		CONTROL, Primary	1
	P	84233	001		• LAMP	16
25	P	84390	001		SPACER, Primary Control	4

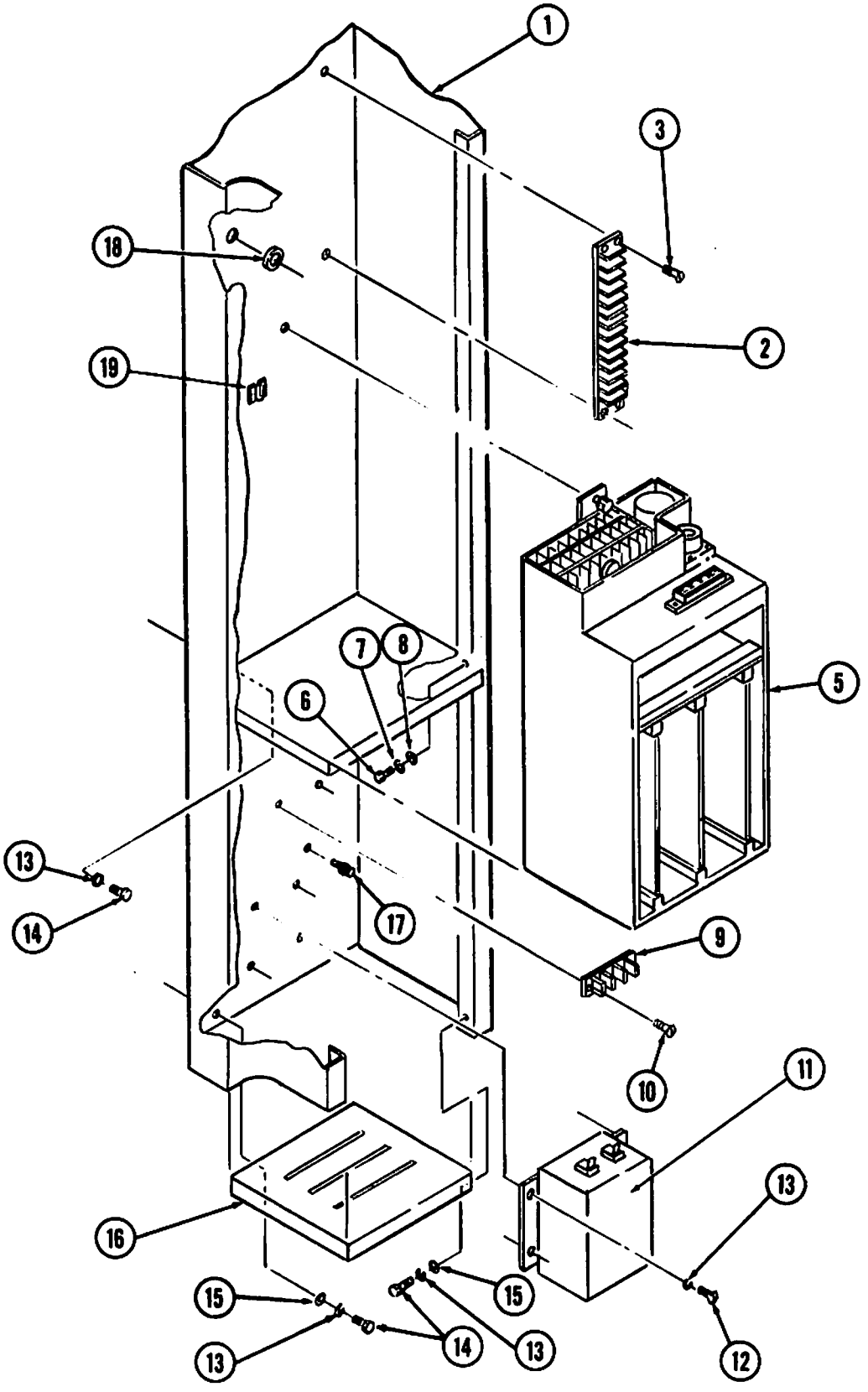


Figure 8-11. CONTROL COLUMN (Part 2 of 3).

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-11-					CONTROL COLUMN (Part 2 of 3)	
1	P	146485	001		HOUSING ASSEMBLY	1
2	P	41560	091		BLOCK, Terminal	1
3	P	3964	041		SCREW, Round Head, #6-32 x 5/8	2
4	P	136759	001		SUPPORT, Controller	1
5	P	146562	002		MAIN CONTROL ASSEMBLY (See Fig. 8-15)	1
6	P	50527	061		SCREW, Socket Head Cap, #8-32 x 1/2	2
7	P	79588	001		LOCKWASHER	2
8	P	17796	091		WASHER, Flat	2
9	P	80746	091		STRIP, Terminal	1
10	P	9661	041		SCREW, #10-32 x 5/8	2
11	P	93821	001		FILTER	1
12	P	4682	041		SCREW, Round Head, #8-32 x 3/8	6
13	P	31705	045		LOCKWASHER	10
14	P	23431	041		SCREW, Socket Head Cap, #10-32 x 3/8	6
15	P	5511	091		WASHER, Flat	4
16	P	136588	002		PLATE, Bottom	1
17	P	82675	001		SCREW, Green Ground, #10-32	1
18	P	24582	091		GROMMET	1
19	P	431152	091		HOLDER, Wire	8

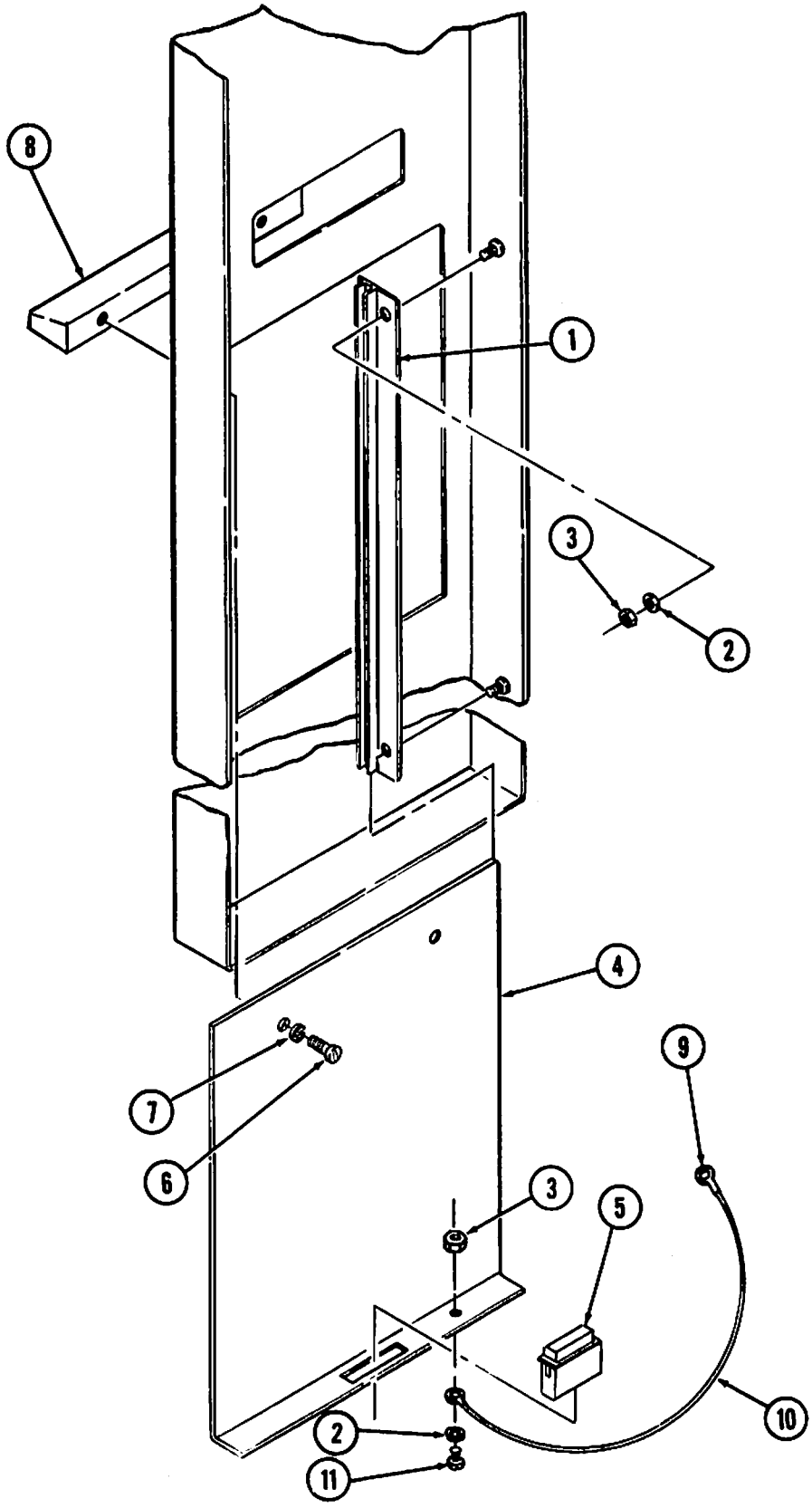


Figure 8-12. CONTROL COLUMN (Part 3 of 3).

FIG. & INDEX NO.	PART NUMBER		SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-12-				CONTROL COLUMN (Part 3 of 3)	
1	P	84394 001		SLIDE, Door	2
2	P	5469 041		WASHER, Flat	5
3	P	3037 041		NUT, Hex, #6-32	5
4	P	93662 001		DOOR	1
5	P	83920 001		CATCH, Magnetic	1
6	P	4682 041		SCREW, Round Head, #8-32 x 3/8	2
7	P	79588 001		LOCKWASHER	2
8	P	84393 001		HANDLE	1
9	P	19521 091		TERMINAL, #6 Ring x 16-22 AWG	2
10				WIRE, Green	1
11	P	50705 041		SCREW, Flat Head, #6-32 x 5/16	1

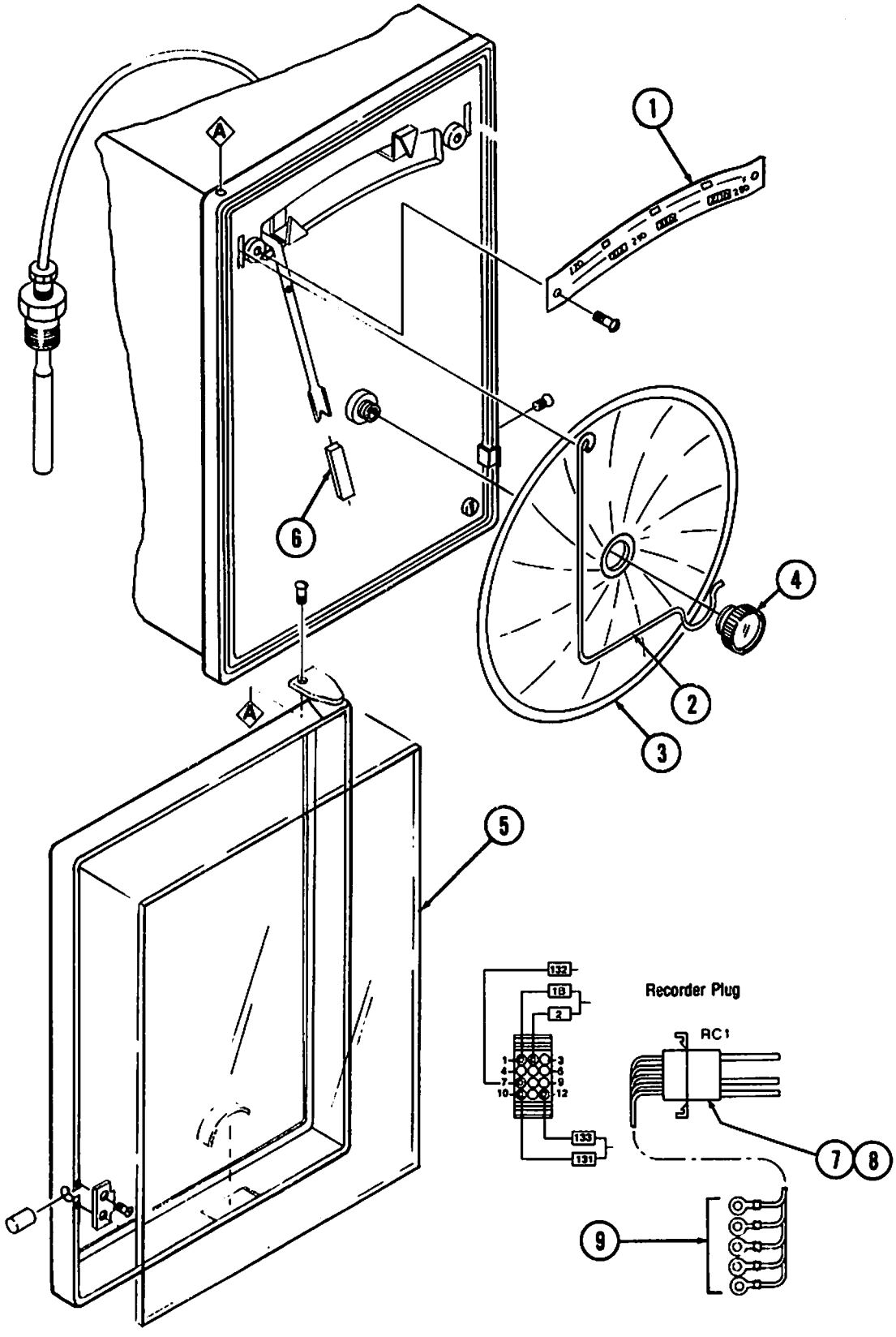


Figure 8-13. INDICATOR-RECORDER-CONTROLLER (Part 1 of 2).

FIG. & INDEX NO.	PART NUMBER		SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-13-	P	83518 001		INDICATOR-RECORDER-CONTROLLER (Part 1 of 2)	X
1				SCALE, Temperature	1
2				LIFTER, Pen	1
3	P	93707 091		CHART, Recording	A/R
4				HUB, Chart	1
5				GLASS, Door	1
6	P	763944 001		CARTRIDGE, Ink, Red (Card of 6)	A/R
7	P	84381 001		CONNECTOR	1
8	P	84382 001		TERMINAL, Pin	5
9	P	19521 091		TERMINAL, #6 Ring x 16-22 AWG	5

WIRE CHART

WIRE	COLOR	SIZE AWG	LENGTH (Inches)
1-B	Black	18	30
2	White	18	30
131	Orange	18	30
132	Violet	18	30
133	Orange	18	30

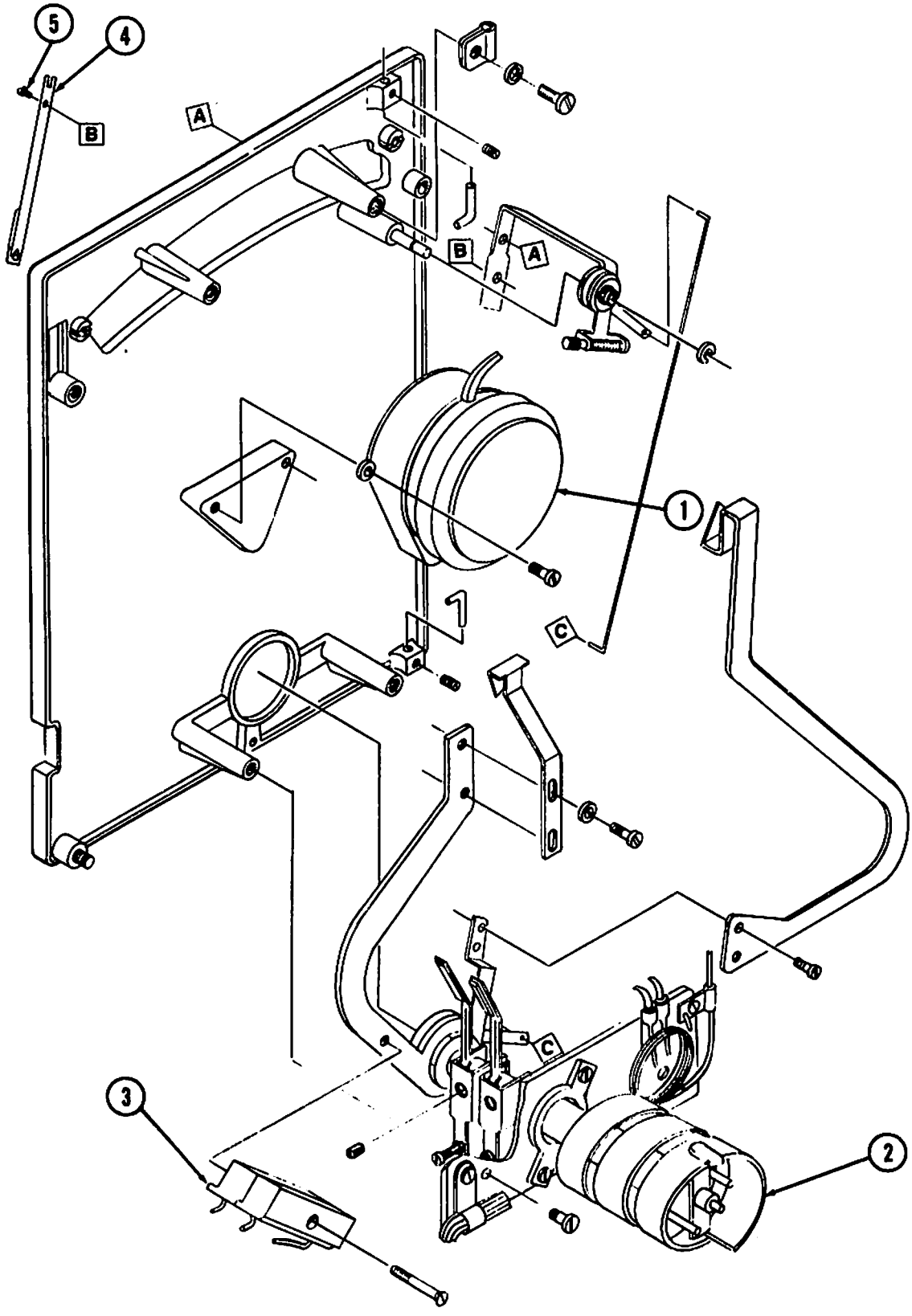


Figure 8-14. INDICATOR-RECORDER-CONTROLLER (Part 2 of 2).

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-14-	P	83518	001		INDICATOR-RECORDER-CONTROLLER (Part 2 of 2)	X
1					MOTOR, Chart Drive	1
2					THERMAL SYSTEM ASSEMBLY	1
3					REED SWITCH, Magnetic	2
4	P	763945	001		ARM, Pen	1
5					SCREW, Pen Arm	1

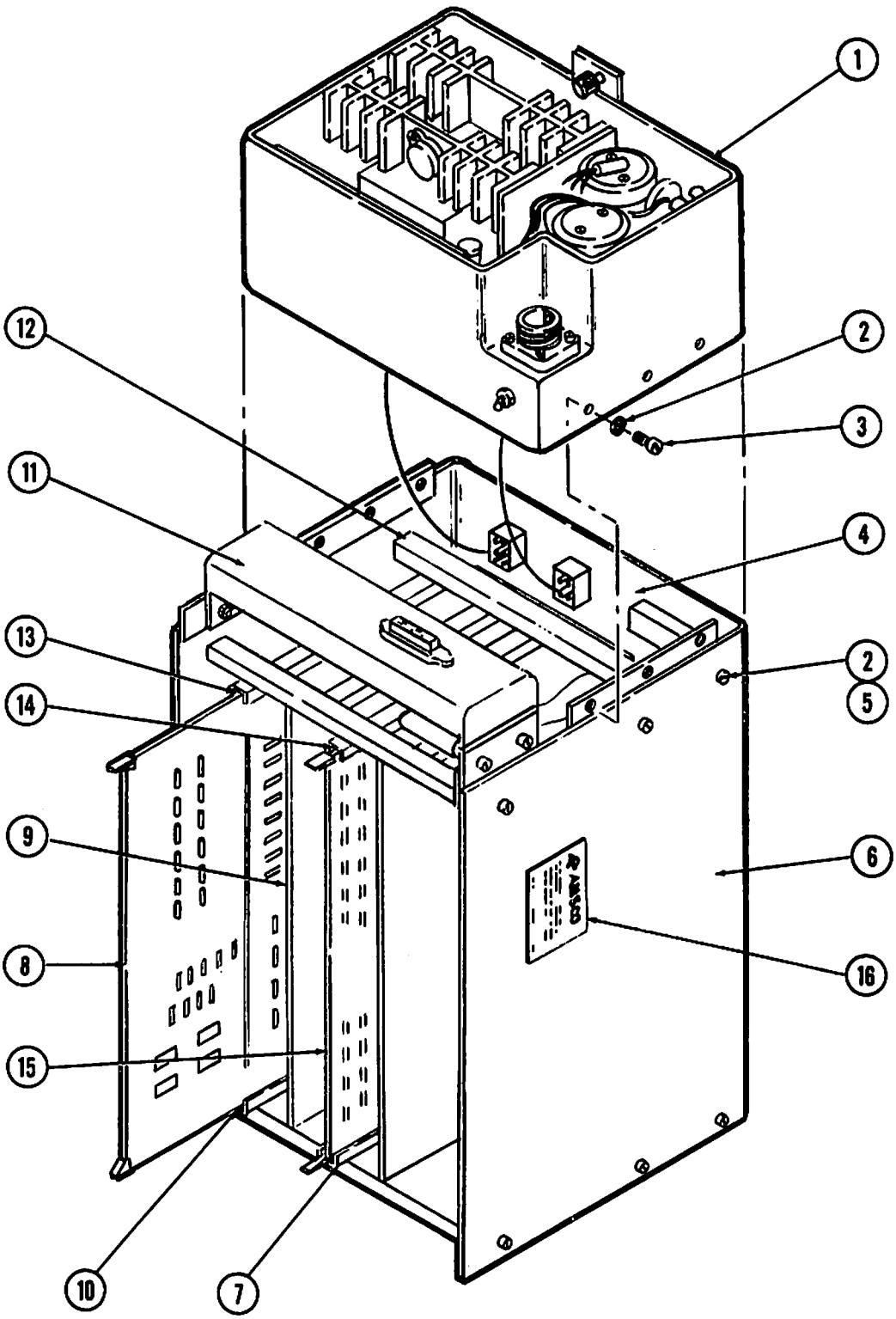


Figure 8-15. MAIN CONTROL ASSEMBLY.

FIG. & INDEX NO.	PART NUMBER			S V C	DESCRIPTION	UNITS PER ASSEMBLY
8-15-	P	146562	002		MAIN CONTROL ASSEMBLY	X
1	P	146402	001		POWER SUPPLY ASSEMBLY	1
2	P	84116	002		LOCKWASHER, #6	22
3	P	40357	001		SCREW, Self Tapping, #6 x 1/4	15
4	P	760244	002		MOTHER BOARD ASSEMBLY	1
5	P	84117	002		SCREW, Pan Head, #6-32 x 5/16	12
6	P	93762	001		CHASSIS	1
7	P	84225	001		GUIDE, Card	4
8	P	146586	001		PC CARD, Basic	1
9	P	84467	001		PLATE, Side	1
10	P	84226	001		TAB, Locking	6
11	P	136714	001		RECEPTACLE BRACKET ASSEMBLY	1
12	P	129030	001		BAR, PC Board, Guide	4
13	P	83528	001		TAB, ID Locking, CPU	1
14	P	83528	007		TAB, ID Locking, I/O 1	1
15	P	146588	001		†PC CARD, Expander	1
16	P	129352	050		PLATE, Identification	1
					Refer to paragraph 7.12 step 7 before installing expander printed circuit board; and to step 6 when replacing any printed circuit board.	

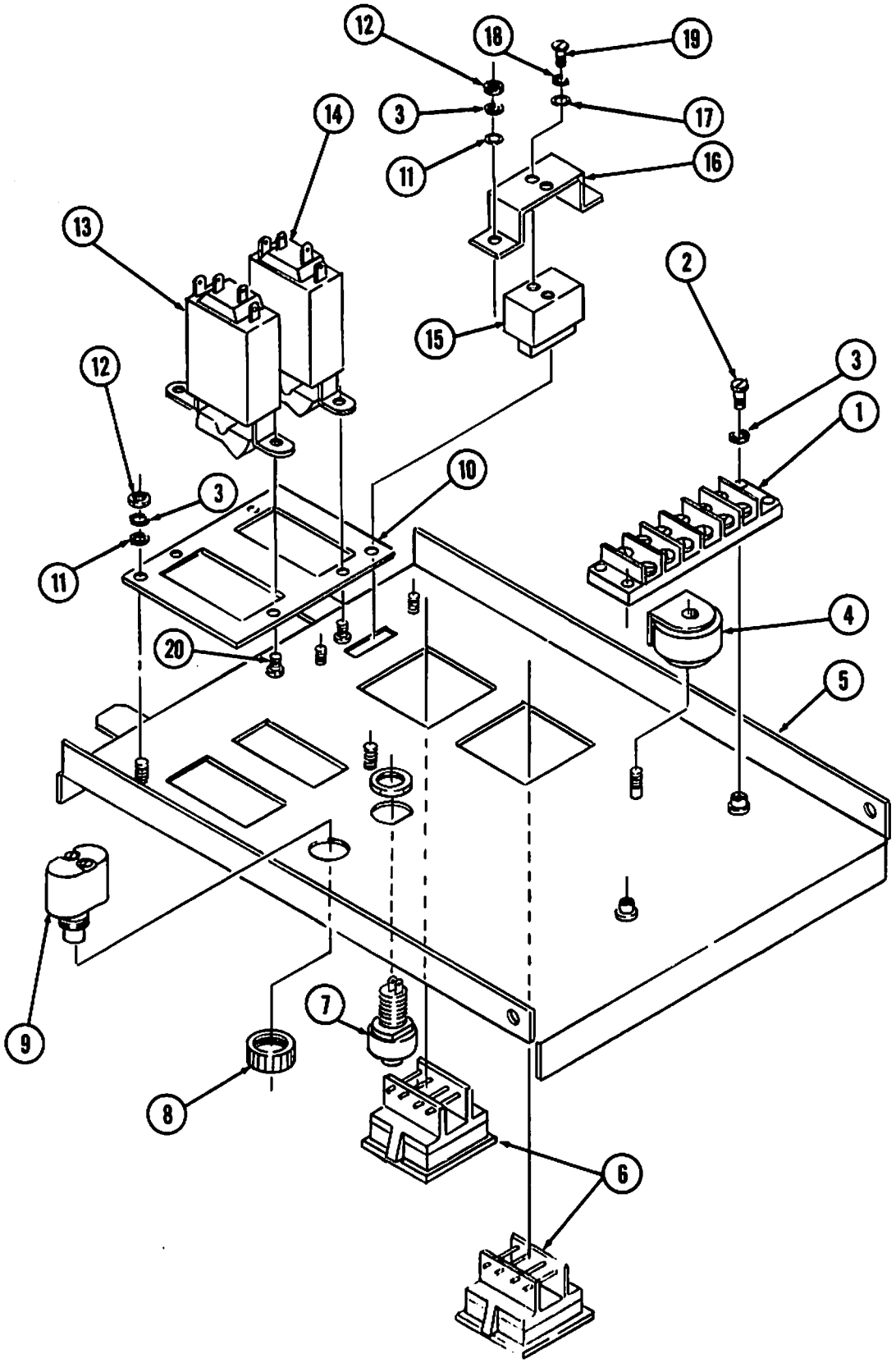


Figure 8-16. SECONDARY CONTROL PANEL (Part 1 of 2).

FIG. & INDEX NO.	PART NUMBER		SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-16-	P	146490 001		SECONDARY CONTROL PANEL (Part 1 of 2)	X
1	P	89174 091		BLOCK, Terminal	1
2	P	3960 041		SCREW, Round Head, #6-32 x 1/2	2
3	P	18131 091		LOCKWASHER, #6	6
4	P	83933 002		BUZZER	1
5	P	146478 002		PANEL, Secondary	1
6	P	136315 002		SWITCH, Thumbwheel, 2 Switch Assembly	2
7	P	84400 001		BREAKER, Circuit, CB2	1
8	P	44155 091		GUARD, Button	1
9	P	48070 091		SWITCH, Push-button, PB1	1
10	P	93757 001		SPACER, Breaker	1
11	P	17589 045		WASHER	4
12	P	3037 041		NUT, Hex	4
13	P	84386 001		BREAKER, Circuit, CB1	1
14	P	129022 001		SWITCH, Rocker, SW1	1
15	P	84362 002		COUNTER	1
16	P	93737 001		BRACKET, Counter	1
17	P	26032 091		WASHER	2
18	P	30743 045		LOCKWASHER	2
19	P	17658 041		SCREW, #4-40 x 3/16	2
20	P	50705 041		SCREW, Flat Head, #6-32 x 5/16	4

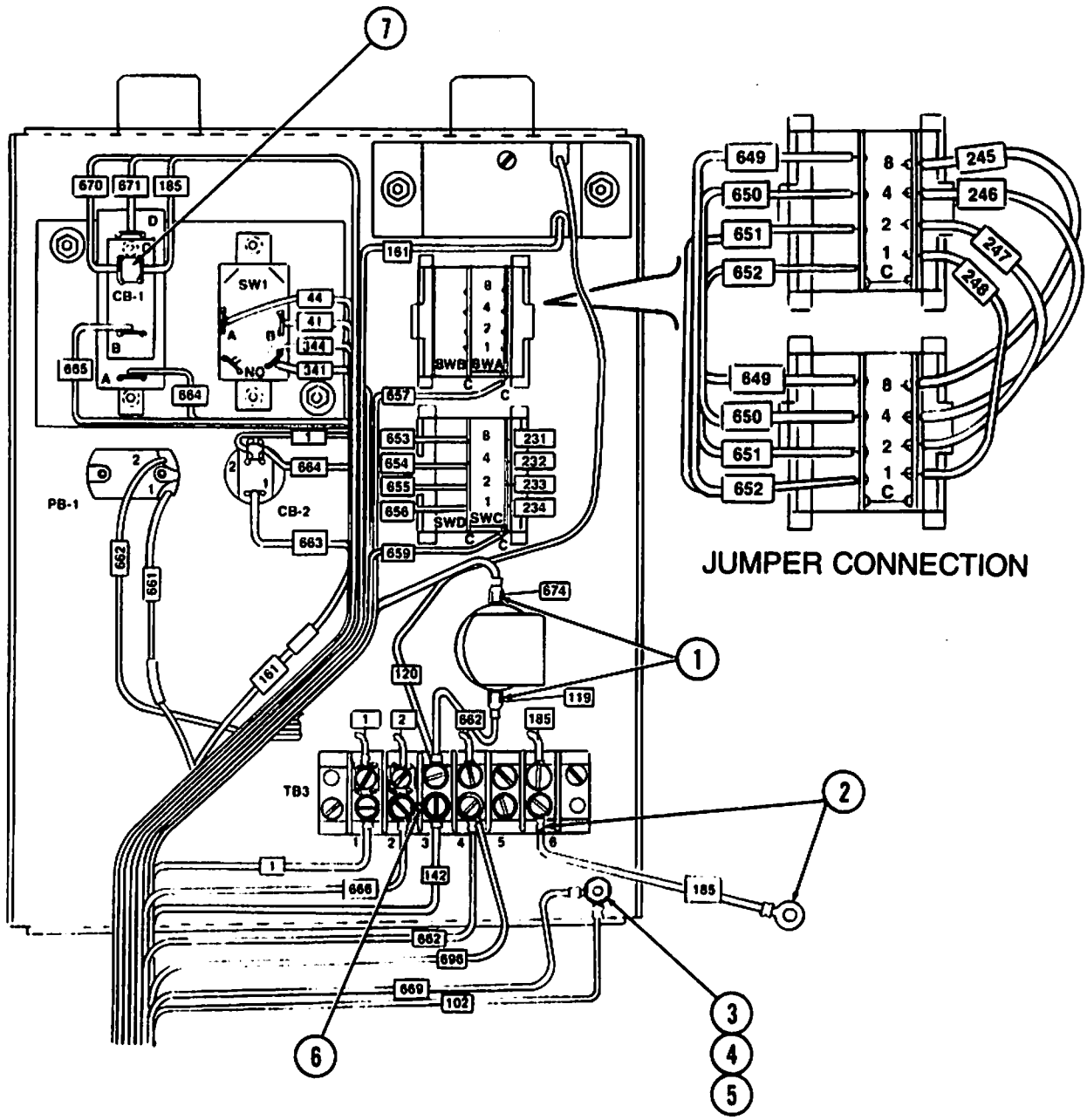


Figure 8-17. SECONDARY CONTROL PANEL (Part 2 of 2).

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-17-	P	146490	001		SECONDARY CONTROL PANEL: (Part 2 of 2)	X
1	P	80981	091		CONNECTOR, Butt	2
2	P	91694	091		RECEPTACLE, 3/16 Lug x #18-22 Wire	2
3	P	19521	091		TERMINAL, Wire, 6 Ring x #16-22 Wire	1
4	P	84123	001		JUMPER, Terminal Block	1
5	P	3037	041		NUT, Hex, #6-32	1
6	P	18131	091		LOCKWASHER, #6	1
7	P	32118	091		ADAPTER, Terminal	2
8	P	17589	045		WASHER, Flat	1

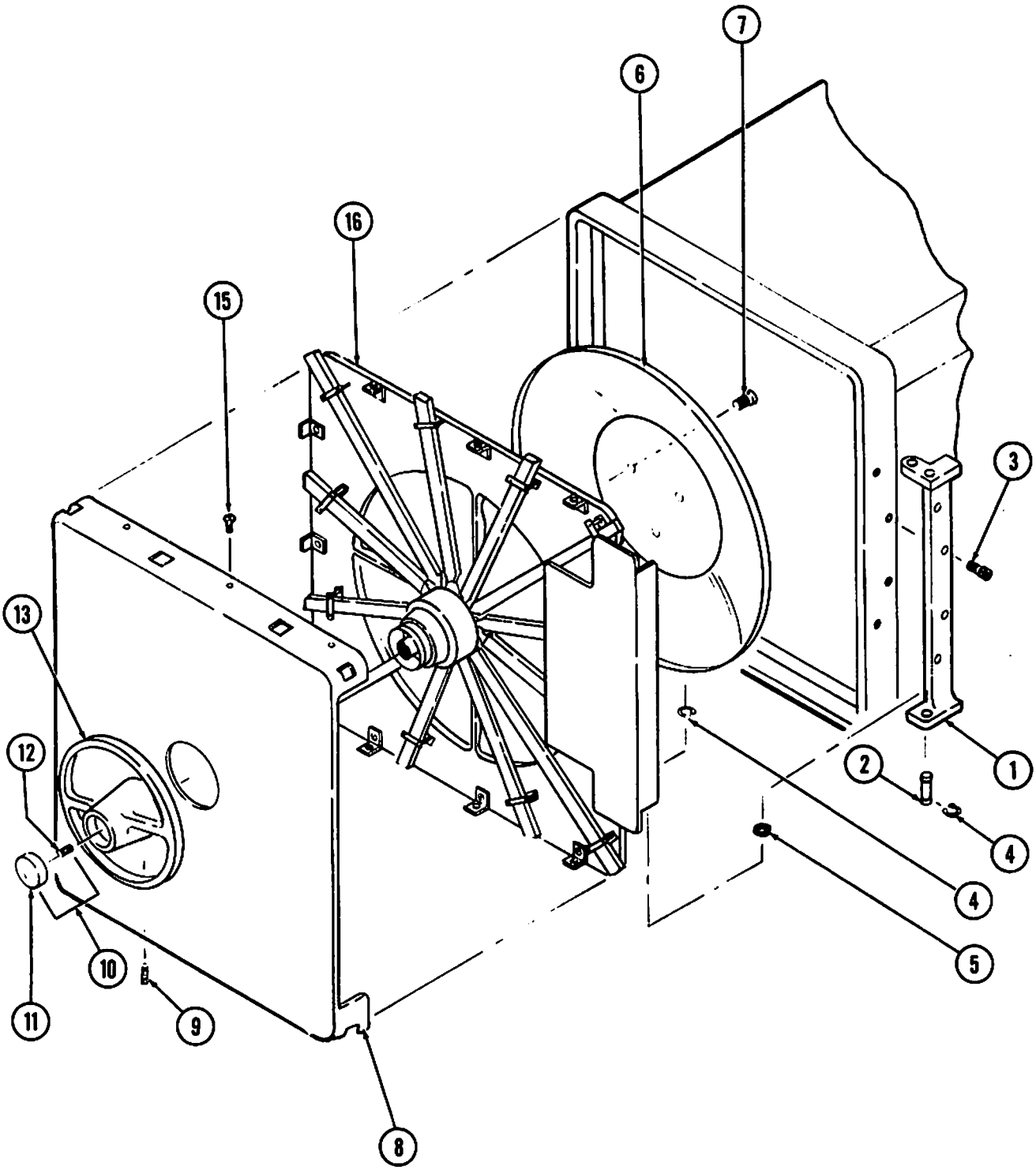


Figure 8-18. COVER AND HANDWHEEL ASSEMBLY.

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY			
8-18-					COVER AND HANDWHEEL ASSEMBLY: 16x16 Sterilizer	X			
					COVER AND HANDWHEEL ASSEMBLY: 20x20 Sterilizer		X		
1	P	90034	063		WELDMENT, Hinge	1			
	P	90119	063		WELDMENT, Hinge		1		
2	P	90041	063		PIN, Hinge	2	2		
3	P	43845	045		CAP SCREW, Socket Head	4	4		
4	P	12706	045		RING, Retaining	2	2		
5	P	79808	001		WASHER, Hinge	A/R	A/R		
6	P	54474	063		COVER, Door Back	1			
	P	54476	063		COVER, Door Back		1		
7	P	12283	041		SCREW, Round Head	3	3		
8	P	139540	063		COVER, Chamber Door, Stainless Steel	1			
	P	149502	063		COVER, Chamber Door, Stainless Steel		1		
9	P	51963	045		SET SCREW	2	2		
10	P	93174	001		BUTTON, Assembly	1	1		
11	P	51960	091		• BUTTON	1	1		
12	P	24911	091		• SET SCREW	1	1		
13	P	146327	001		HANDLE, Chamber Door	1	1		
14	P	93647	001		FACE PLATE	1	1		
15	P	90562	061		SCREW, Self Tapping	9	5		
16					DOOR LOCK AND HINGE ASSEMBLY (Refer to Fig. 8-19)	1	1		

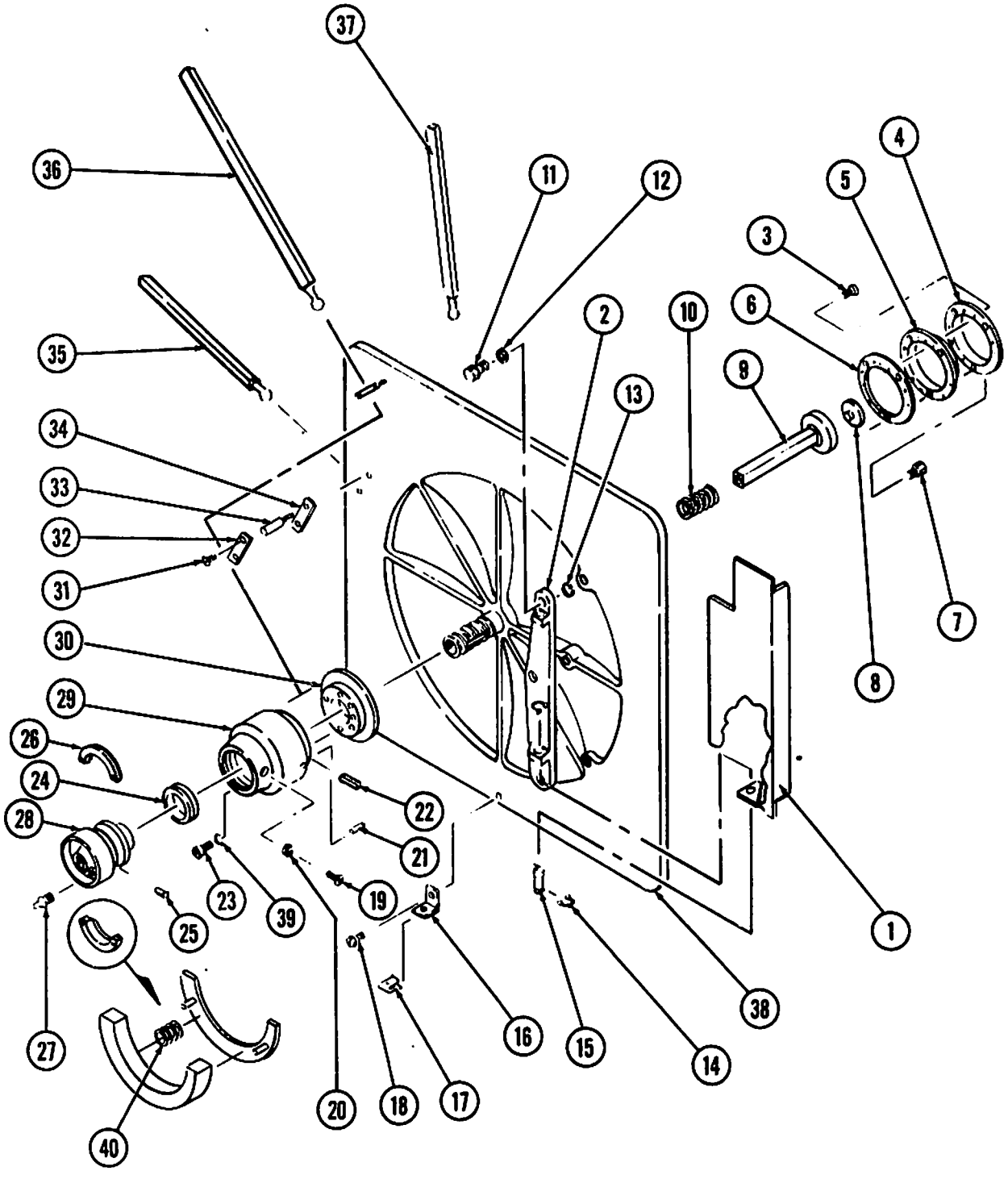


Figure 8-19. DOOR LOCK AND HINGE ASSEMBLY.

FIG. & INDEX NO.		PART NUMBER		S V C	DESCRIPTION	UNITS PER ASSEMBLY	
8-19-					DOOR LOCK AND HINGE ASSEMBLY: 16x16 Sterilizer	X	
					DOOR LOCK AND HINGE ASSEMBLY: 20x20 Sterilizer		X
1	P	93303	001		HINGE WELDMENT, Door	1	
	P	96098	001		HINGE WELDMENT, Door		1
2	P	93300	001		DOOR HINGE BRACKET	1	
	P	134194	001		DOOR HINGE BRACKET		1
3	P	4782	061		BOLT, Machine, Finished	9	9
4	P	6624	091		COVER, Diaphragm	1	1
5	P	7230	061		DIAPHRAGM	1	1
6	P	7753	091		GASKET, Diaphragm	1	1
7	P	74710	061		SCREW, Special	3	3
8	P	8778	091		THRUST PLATE ASSEMBLY	1	1
9	P	90363	091		ROD WELDMENT, Lock Clutch	1	1
10	P	12267	001		SPRING, Lock Clutch Rod	1	1
11	P	3860	041		SCREW, Hex Head	3	
	P	89257	041		SCREW, Hex Head		3
12	P	43362	061		WASHER, Plain	3	
	P	17264	042		WASHER, Plain		3
13	P	52149	045		WASHER, Shake Proof	3	
	P	52148	045		WASHER, Shake Proof		3
14	P	12706	045		RING, Retaining	4	4
15	P	24520	042		PIN, Hinge	2	
	P	89265	082		PIN, Hinge		2
16	P	90440	081		BRACKET, Door Cover	9	
	P	150136	001		BRACKET, Door Cover		5
17	P	90198	045		SPEED NUT		5
18	P	90169	045		SCREW, Self Tapping	9	5
19	P	10570	061		SCREW, Truss Head	2	2
20	P	19678	045		LOCKWASHER	2	2
21	P	22996	061		ROLL PIN	2	2
22	P	8303	091		KEY, Door	2	2
23	P	12264	042		SCREW, Socket Head	6	6
24	P	6416	091		BEARING, Ball Thrust	1	1
25	P	47598	061		DRIVE SCREW	1	1
26	P	13194	091		THRUST RING ASSEMBLY	1	1
27	P	90475	091		LUBE FITTING	1	1
28	P	96102	091		NUT, Handle	1	1
29	P	96181	056		PLATE, Top Socket	1	1
30	P	11817	056		PLATE, Bottom Socket	1	1
31	P	39863	091		SCREW, Round Head	24	24
32	P	150365	001		LINK, Arm Clip	12	12
33	P	33429	001		STUD, Arm Clip	24	
	P	150135	001		STUD, Arm Clip		24
34	P	33435	045		BLOCK, Fulcrum Arm Clip	18	
	P	150134	001		BLOCK, Fulcrum Arm Clip		12
35	P	92634	001		ARM, Door	8	
	P	92633	001		ARM, Door		4
36	P	55972	004		ARM, Door	4	
	P	55973	002		ARM, Door		4
37	P	92633	002		ARM, Door		4
38					DOOR ASSEMBLY (Refer to Fig. 8-20)	1	1
39	P	5596	041		LOCKWASHER	6	6
40	P	12260	091		SPRING, Thrust Ring	4	4

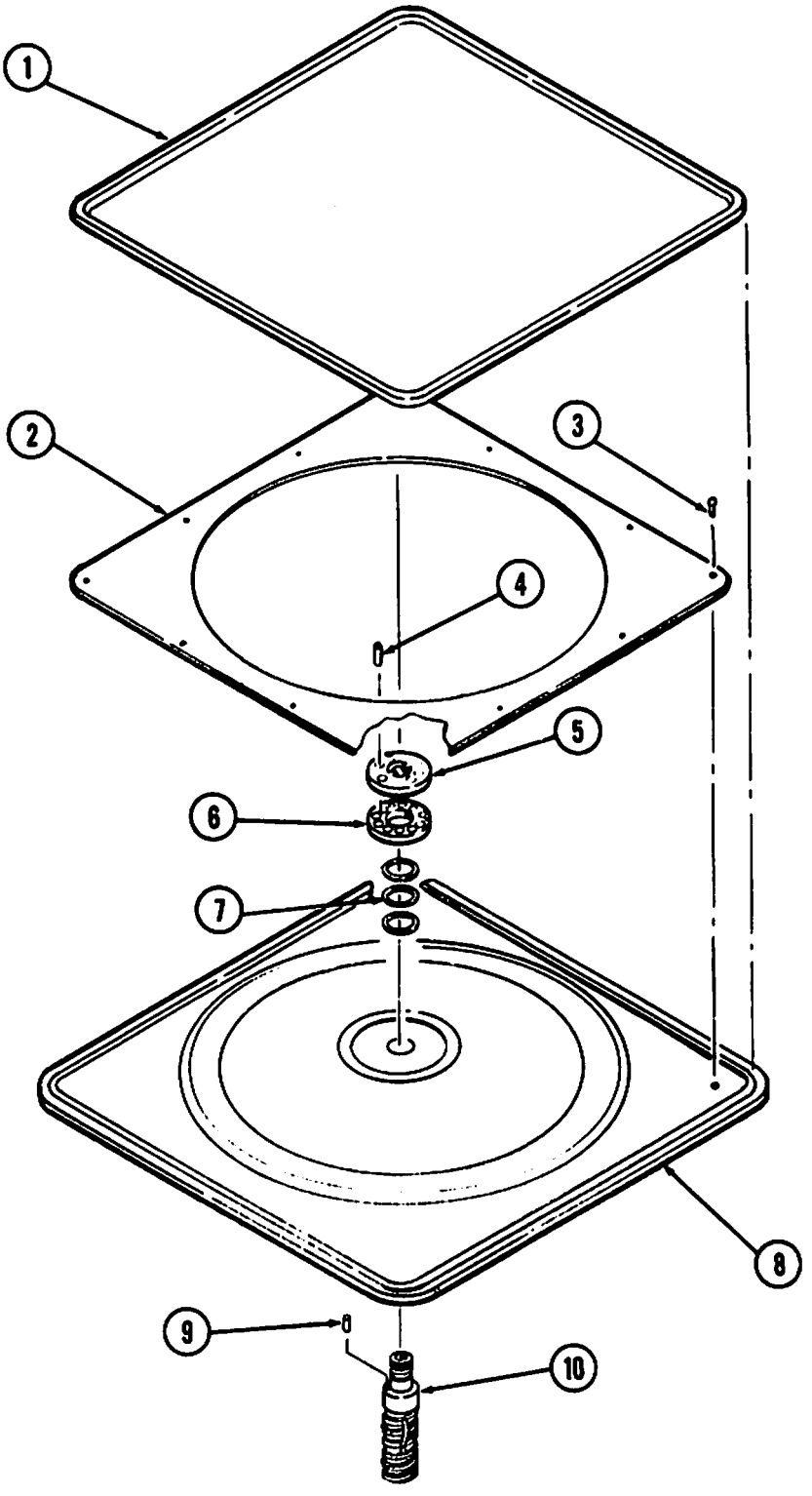


Figure 8-20. DOOR ASSEMBLY.

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY			
8-20-					DOOR ASSEMBLY: 16x16	X			
					DOOR ASSEMBLY: 20x20		X		
1	P	74367	091		GASKET	1			
	P	78767	091		GASKET		1		
2	P	54475	061		COVER, Door Back	1			
	P	97889	061		COVER, Door Back		1		
3	P	47598	061		DRIVE SCREW	18	12		
4	P	21428	061		DOWEL PIN	2	2		
5	P	9083	091		RING, Lock Clutch	1	1		
6	P	22057	091		NUT, Door Post	1	1		
7	P	150330	001		SHIM, Door	A/R	A/R		
	P	150330	002		SHIM, Door	A/R	A/R		
8	P	149505	091		DOOR	1			
	P	141105	001		DOOR		1		
9	P	2893	061		PIN	1	1		
10	P	22058	091		POST, Door	1	1		

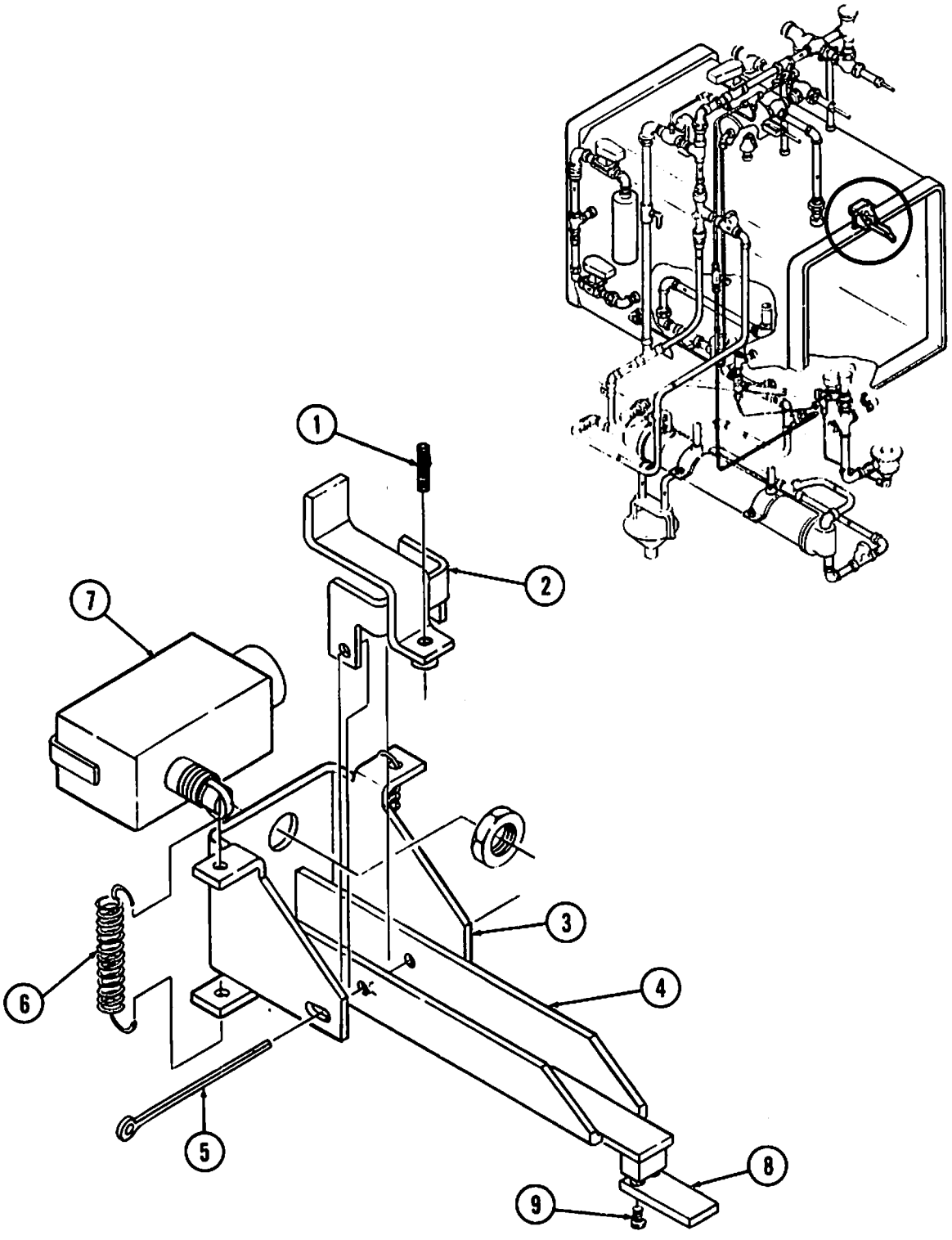


Figure 8-21. DOOR SWITCH ASSEMBLY.

FIG. & INDEX NO.	PART NUMBER		SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-21-	P 136475	001		DOOR SWITCH ASSEMBLY	X
1	P 25542	091		SCREW, Socket Set	1
2	P 90706	045		LEVER, Weldment	1
3	P 936134	045		BRACKET	1
4	P 90748	045		ARM, Weldment	1
5	P 90593	061		PIN, Cotter	1
6	P 90751	061		SPRING	2
7	P 90752	091		SWITCH	1
8	P 90871	045		EXTENSION, Switch	1
9	P 4682	041		SCREW, Round Head #8-32 x 3/8	2

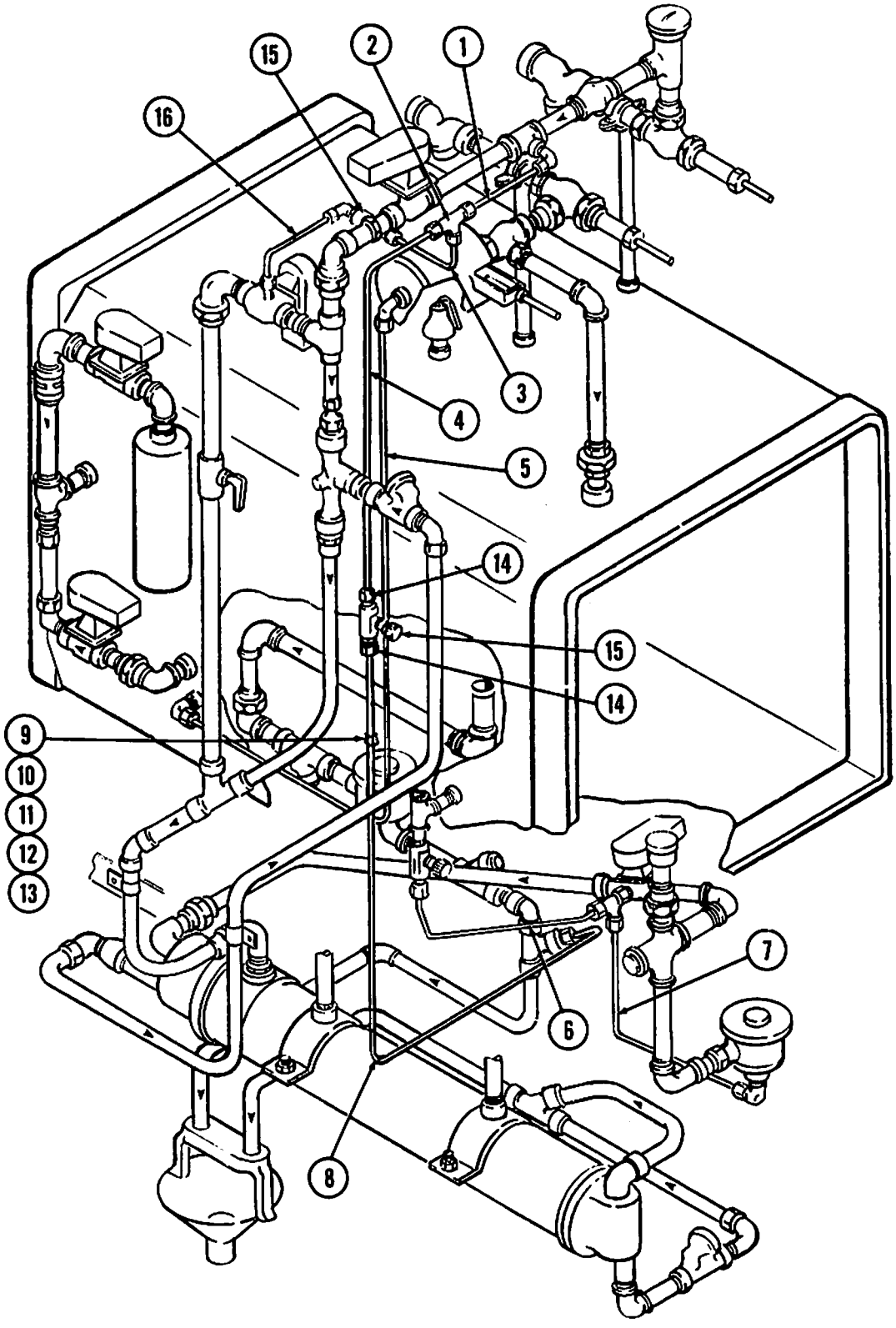


Figure 8-22. PIPING ASSEMBLY, Complete.

FIG. & INDEX NO.	PART NUMBER			S V C	DESCRIPTION	UNITS PER ASSEMBLY
8-22-	P	146551	001		PIPING ASSEMBLY, Complete	X
1					TUBE, 1/4 O.D. x 4-9/32	1
2	P	46097	091		TEE, Compression, 1/4 O.D.T.	1
3					TUBE, 1/4 O.D. x 4-5/8	1
4					TUBE, 1/4 O.D. x 20-1/16	1
5					TUBE, 1/4 O.D. x 33-1/16	1
6					TUBE, 5/16 O.D. x 20	1
7					TUBE, 5/16 O.D. x 8-3/8	1
8					TUBE, 1/4 O.D. x 38-15/16	1
9	P	26720	091		CLAMP, 1/4 O.D.T.	1
10	P	3986	041		SCREW, #8-32 x 1/2	1
11	P	5561	091		WASHER, Flat	1
12	P	90991	091		LOCKWASHER	1
13	P	3038	041		NUT, Hex, #8-32	1
14	P	19514	091		FITTING, Compression, 1/4 O.D.T. x 1/8 N.P.T.	3
15	P	83630	001		VALVE, Needle, 1/8 N.P.T.	2
16					TUBE, 1/4 O.D. x 6-5/8	1
17					PIPING SUBASSEMBLY, Top (See Fig. 8-23)	1
18					PIPING SUBASSEMBLY, Side (See Fig. 8-24)	1
19					PIPING SUBASSEMBLY, Bottom (See Fig. 8-25)	1

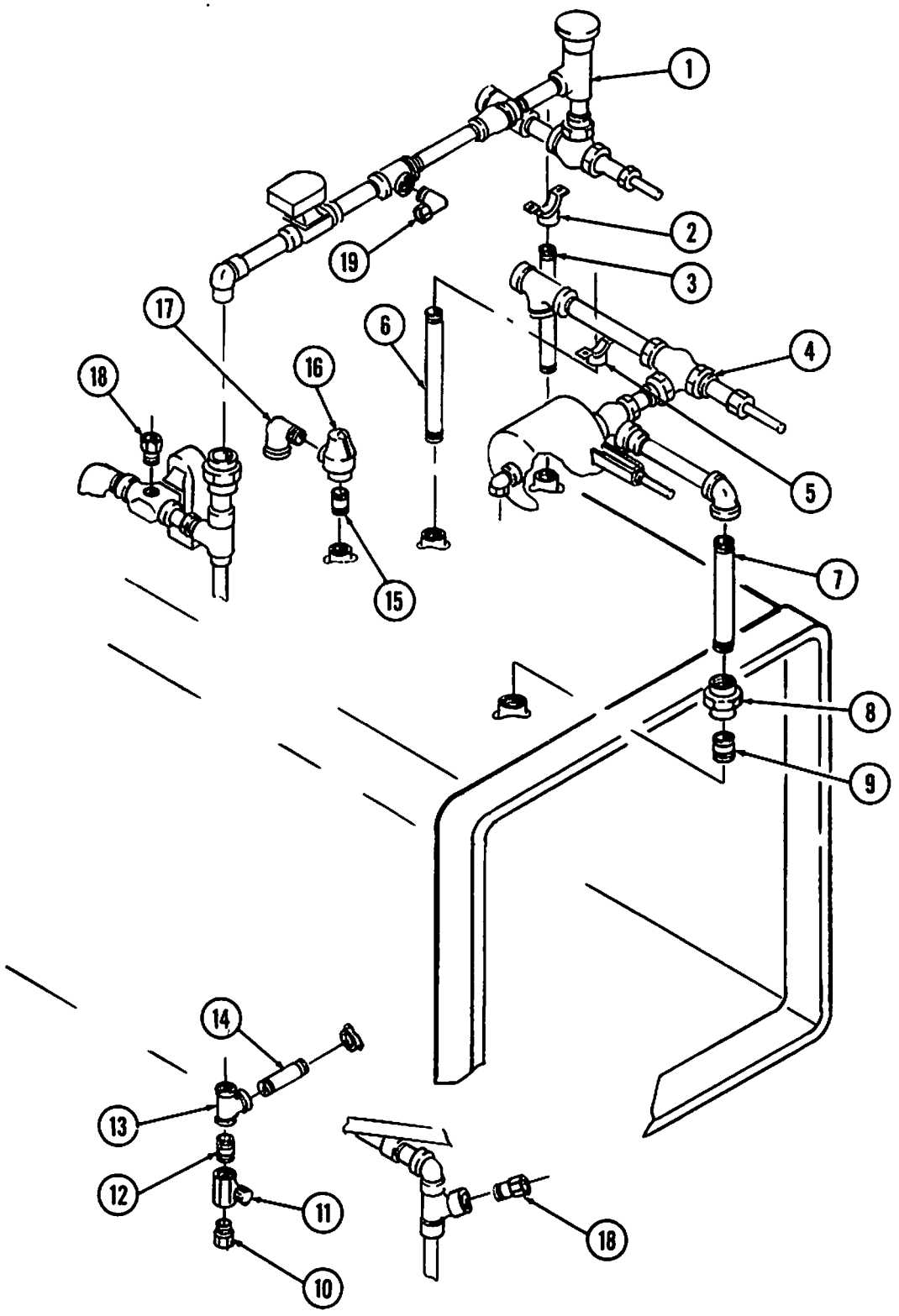


Figure 8-23. PIPING SUBASSEMBLY, Top.

FIG. & INDEX NO.	PART NUMBER		SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-23-				PIPING SUBASSEMBLY, Top	X
1	P 136648	001		WATER SUPPLY ASSEMBLY (See Fig. 8-27)	1
2	P 39590	010		CLAMP, Pipe, 3/4	1
3	P 84375	005		NIPPLE, Steel, 1/4 N.P.T. x 8-1/2	1
4	P 93708	001		STEAM SUPPLY ASSEMBLY (See Fig. 8-26)	1
5	P 75376	010		CLAMP, Pipe, 3/8	1
6	P 84375	004		NIPPLE, Steel, 1/4 N.P.T. x 8-11/16	1
7	P 29036	091		NIPPLE, 3/8 N.P.T. x 6-3/4	1
8	P 5266	091		UNION, 3/8 N.P.T.	1
9	P 29013	091		NIPPLE, 3/8 N.P.T. x 1	1
10	P 22711	091		FITTING, Compression, 5/16 O.D.T. x 1/4 N.P.T.	1
11	P 83523	001		VALVE, Needle, 1/4 N.P.T.	1
12	P 28917	091		NIPPLE, 1/4 N.P.T. x 1	1
13	P 4906	091		TEE, 1/4 N.P.T.	1
14	P 28922	091		NIPPLE, 1/4 N.P.T. x 2-1/4	1
15	P 836	042		BUSHING, Reducing, 3/4 x 1/2 N.P.T.	1
16	P 150527	001		VALVE, Safety, 1/2 N.P.T.	1
17	P 1636	091		ELL, Street, 3/4 N.P.T.	1
18	P 19514	091		FITTING, Compression, 1/4 O.D.T. x 1/8 N.P.T.	1
19	P 42510	091		ELL, Compression, 1/4 O.D.T. x 1/8 N.P.T.	1

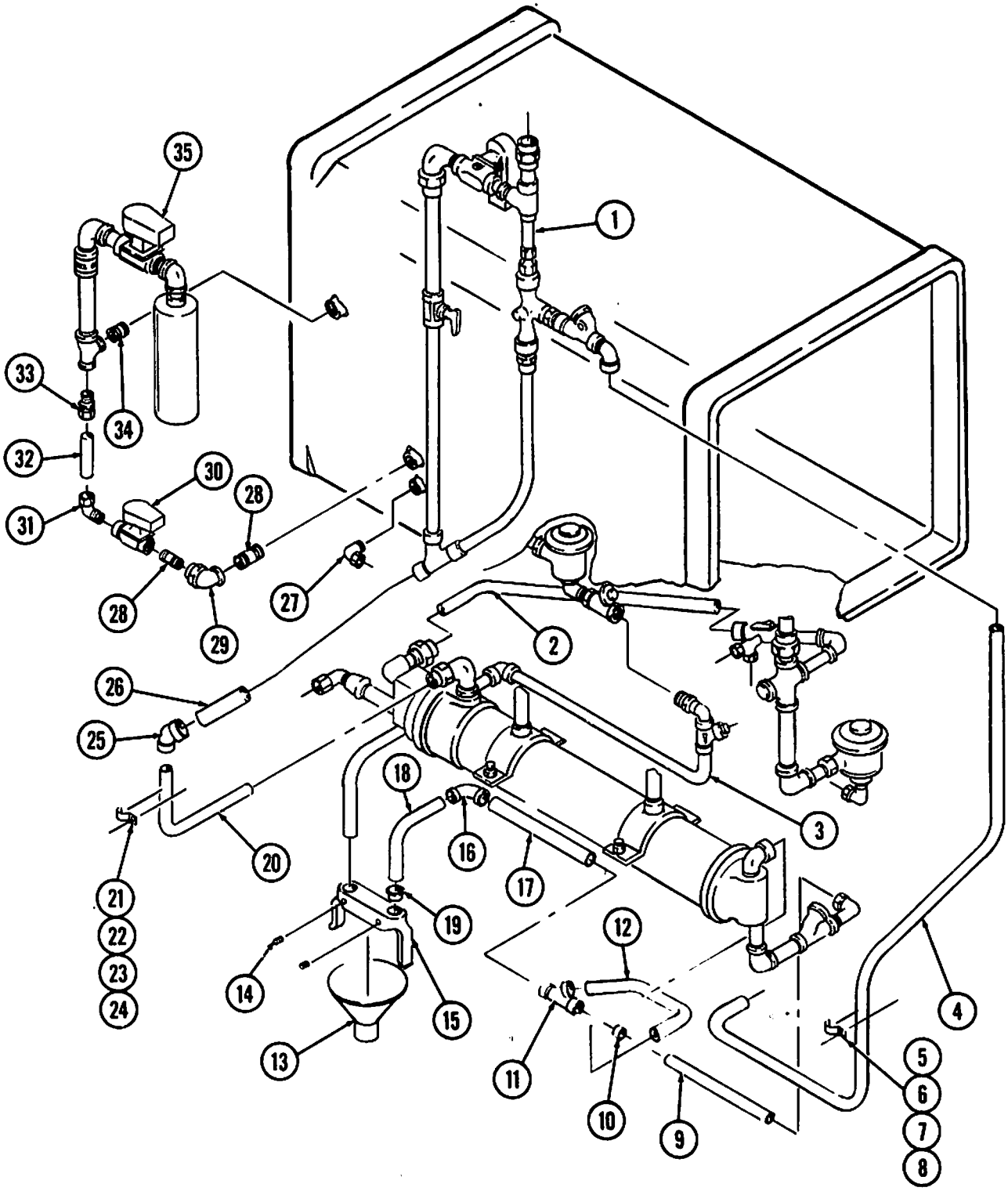


Figure 8-24. PIPING SUBASSEMBLY, Side.

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-24-					PIPING SUBASSEMBLY, Side	X
1	P	136655	001		EJECTOR ASSEMBLY (See Fig. 8-29)	1
2	P	93709	001		TUBE, Exhaust, 7/8 O.D.	1
3	P	136667	001		DRAIN ASSEMBLY (See Fig. 8-30)	1
4	P	136656	001		TUBE, 5/8 O.D.	1
5	P	90513	091		CLAMP, 5/8 O.D.T.	1
6	P	41805	044		SCREW, #10-32 x 5/8	1
7	P	76801	045		LOCKWASHER	1
8	P	2959	041		NUT, Hex, #10-32	1
9	P	90460	091		TUBE, 5/8 O.D. x 7-3/8	1
10	P	91223	091		REDUCER, 7/8 x 5/8 O.D.T.	1
11	P	89384	091		"Y" BRANCH, 7/8 O.D.T.	1
12	P	93090	001		TUBE, 7/8 O.D.	1
13	P	55950	091		FUNNEL, Waste	1
14	P	25453	091		SETSCREW, Socket Head, 1/4-20	2
15	P	96438	091		FIXTURE, Air Gap	1
16	P	28103	091		ELBOW, 7/8 O.D.T.	1
17	P	91237	091		TUBE, 7/8 O.D. x 7-1/4	1
18	P	93090	005		TUBE, 7/8 O.D.	1
19	P	91317	091		REDUCER, 1-1/8 x 7/8 O.D.T.	1
20	P	84453	001		TUBE, Water, 7/8 O.D.	1
21	P	91215	010		CLAMP, 7/8 O.D.T.	1
22	P	3950	048		SCREW, 1/4-20 x 5/8	1
23	P	76230	091		LOCKWASHER, Shake-Proof	1
24	P	3040	042		NUT, Hex, 1/4-20	1
25	P	84456	001		ELL, 45°, 7/8 O.D.T.	1
26	P	91238	091		TUBE, 7/8 O.D. x 4-3/8	1
27	P	41306	091		ELL, Compression, 1/4 O.D.T. x 1/4 N.P.T.	1
28	P	29013	091		NIPPLE, 3/8 N.P.T. x 1	2
29	P	89153	091		ELL, Union, 3/8 N.P.T.	1
30	P	83264	002		VALVE, Solenoid, 3/8 N.P.T. (S-2)	1
P964317-687	P	~~764070~~	~~001~~		• KIT, Valve Repair	1
	P	764070	002		• COIL, 120 V. 60 Hz, 110 V. 50 Hz.	1
31	P	40153	091		ELL, Compression, 5/8 O.D.T. x 3/8 N.P.T.	1
32	P	90273	091		TUBE, 5/8 O.D. x 3-1/2	1
33	P	29931	091		FITTING, Compression, 5/8 O.D.T. x 1/2 N.P.T.	1
34	P	29163	091		NIPPLE, 1/2 N.P.T. x 1-1/4	1
35	P	136654	001		AIR BREAK ASSEMBLY (See Fig. 8-28)	1

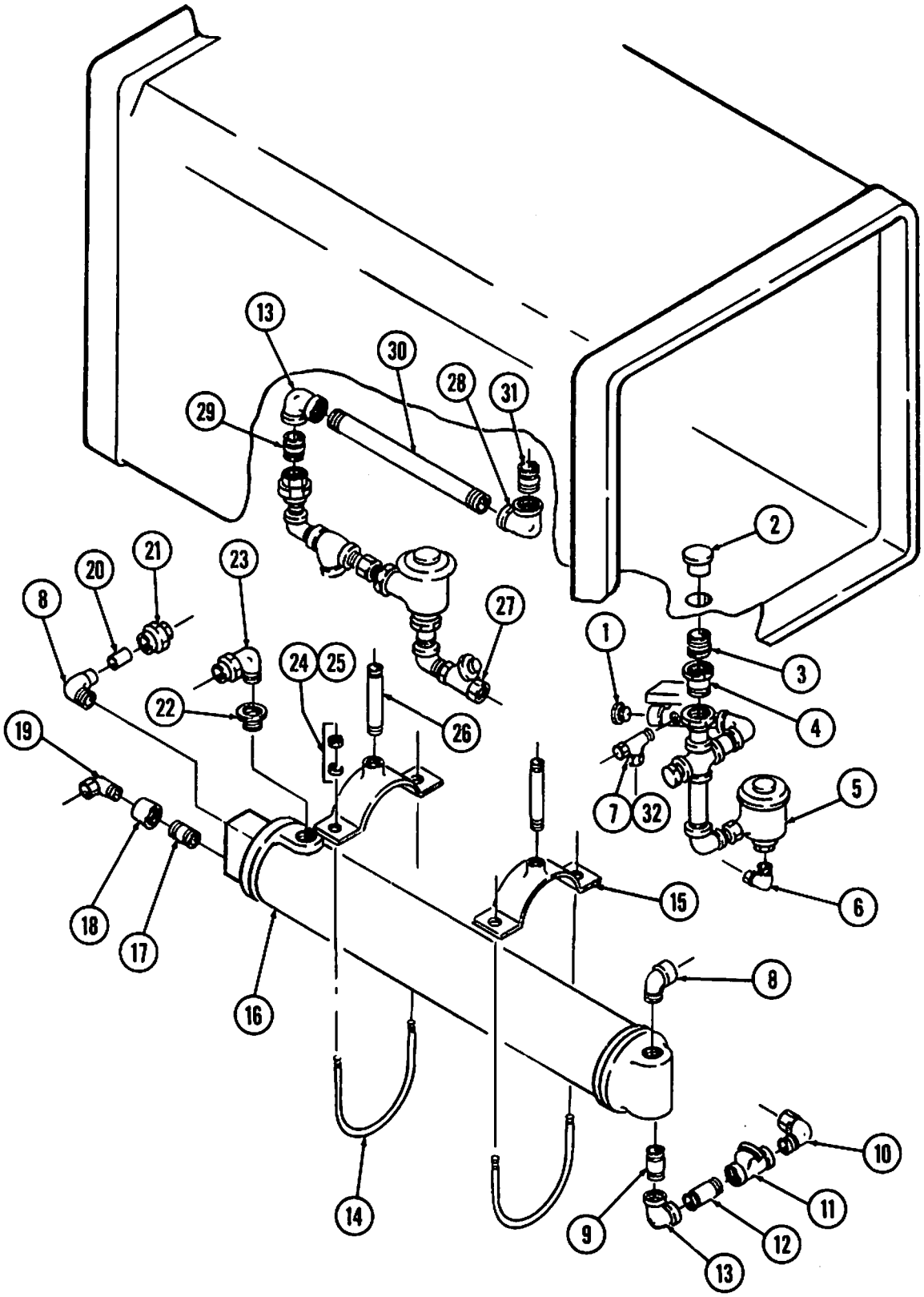


Figure 8-25. PIPING SUBASSEMBLY, Bottom.

FIG. & INDEX NO.	PART NUMBER			S V C	DESCRIPTION	UNITS PER ASSEMBLY
8-25-					PIPING SUBASSEMBLY, Bottom	X
1	P	91158	091		ADAPTER, 7/8 O.D.T. x 3/4 N.P.T.	1
2	P	93294	001		SCREEN, Chamber Drain	1
3	P	29294	091		NIPPLE, 3/4 N.P.T. x 2	1
4	P	1747	091		THREAD END, 3/4 N.P.T.	1
5	P	136668	001		CHAMBER DRAIN ASSEMBLY (See Fig. 8-30)	1
6	P	7033	091		ELL, Compression, 5/16 O.D.T. x 1/4 N.P.T.	1
7	P	6774	091		TEE, Compression, 5/16 O.D.T. x 1/8 N.P.T. x 5/16 O.D.T.	1
8	P	8996	091		ELL, 7/8 O.D.T. x 1 N.P.T.	2
9	P	29015	091		NIPPLE, 3/8 N.P.T. x 1-1/2	1
10	P	40153	091		ELL, Compression, 5/8 O.D.T. x 3/8 N.P.T.	1
11	P	5424	091		VALVE, Check, 3/8 N.P.T.	1
	P	74335	091		• DISC	1
12	P	29014	091		NIPPLE, 3/8 N.P.T. x 1-1/4	1
13	P	1630	091		ELL, 3/8 N.P.T.	2
14	P	93163	001		"U" BOLT	2
15	P	93161	001		STRAP	2
16	P	76782	010		HEAT EXCHANGER	1
17	P	29357	091		NIPPLE, 1 N.P.T. x 2-1/4	1
18	P	118384	091		COUPLING, 1 x 1/2 N.P.T.	1
19	P	23972	091		FITTING, 5/8 O.D.T. x 1/2 N.P.T.	1
20	P	89400	091		TUBE, 7/8 O.D.T. x 1-5/8	1
21	P	91226	091		UNION, 7/8 O.D.T.	1
22	P	841	042		BUSHING, Reducing, 1 x 3/4 N.P.T.	1
23	P	91230	091		ELL, Union, 7/8 O.D.T. x 3/4 N.P.T.	1
24	P	3098	045		NUT, Hex, 5/16-18	4
25	P	19679	041		LOCKWASHER, 5/16	4
26	P	32880	091		NIPPLE, Steel, 3/4 N.P.T. x 7-3/4	2
27	P	136666	001		DRAIN TRAP ASSEMBLY (See Fig. 8-30)	1
28	P	7461	091		ELL, Reducing, 3/4 x 3/8 N.P.T.	1
29	P	29013	091		NIPPLE, 3/8 N.P.T. x 1	1
30	P	29049	091		NIPPLE, 3/8 N.P.T. x 10	1
31	P	29292	091		NIPPLE, 3/4 N.P.T. x 1-1/2	1
32	P	1615	091		ELL, Street, 1/8 N.P.T.	1

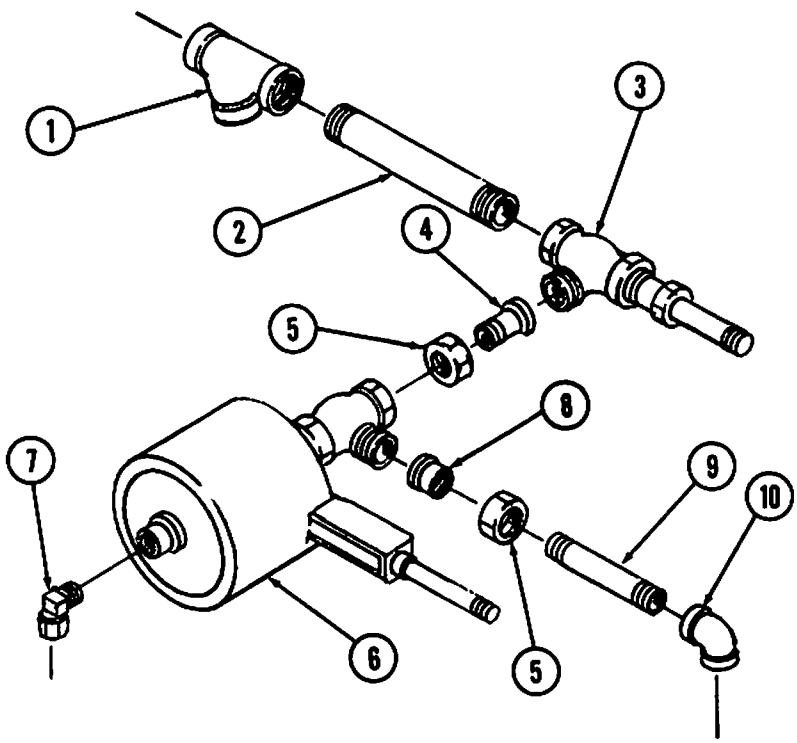


Figure 8-26. STEAM SUPPLY ASSEMBLY.

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-26-	P	93708	001		STEAM SUPPLY ASSEMBLY	X
1	P	47671	091		STRAINER, Steam, 3/8 N.P.T.	1
	P	50341	091		• SCREEN	1
	P	28447	091		• "O" RING P 28447 091	1
2	P	29028	091		NIPPLE, 3/8 N.P.T. x 4-3/4	1
3	P	5654	051		VALVE, Angle, 3/8 N.P.T. (See Fig. 8-33)	1
4	P	4076	091		SPUD, Male, 3/8 N.P.T.	1
5	P	2901	091		NUT, Union	2
6	P	20661	091		VALVE, Steam Control, 3/8 N.P.T. (See Fig. 8-31)	1
7	P	21990	091		ELL, Compression, 1/4 O.D.T. x 1/8 N.P.T.	1
8	P	4201	091		SPUD, Female, 3/8 N.P.T.	1
9	P	29024	091		NIPPLE, 3/8 N.P.T. x 3-3/4	1
10	P	1630	091		ELL, 3/8 N.P.T.	1

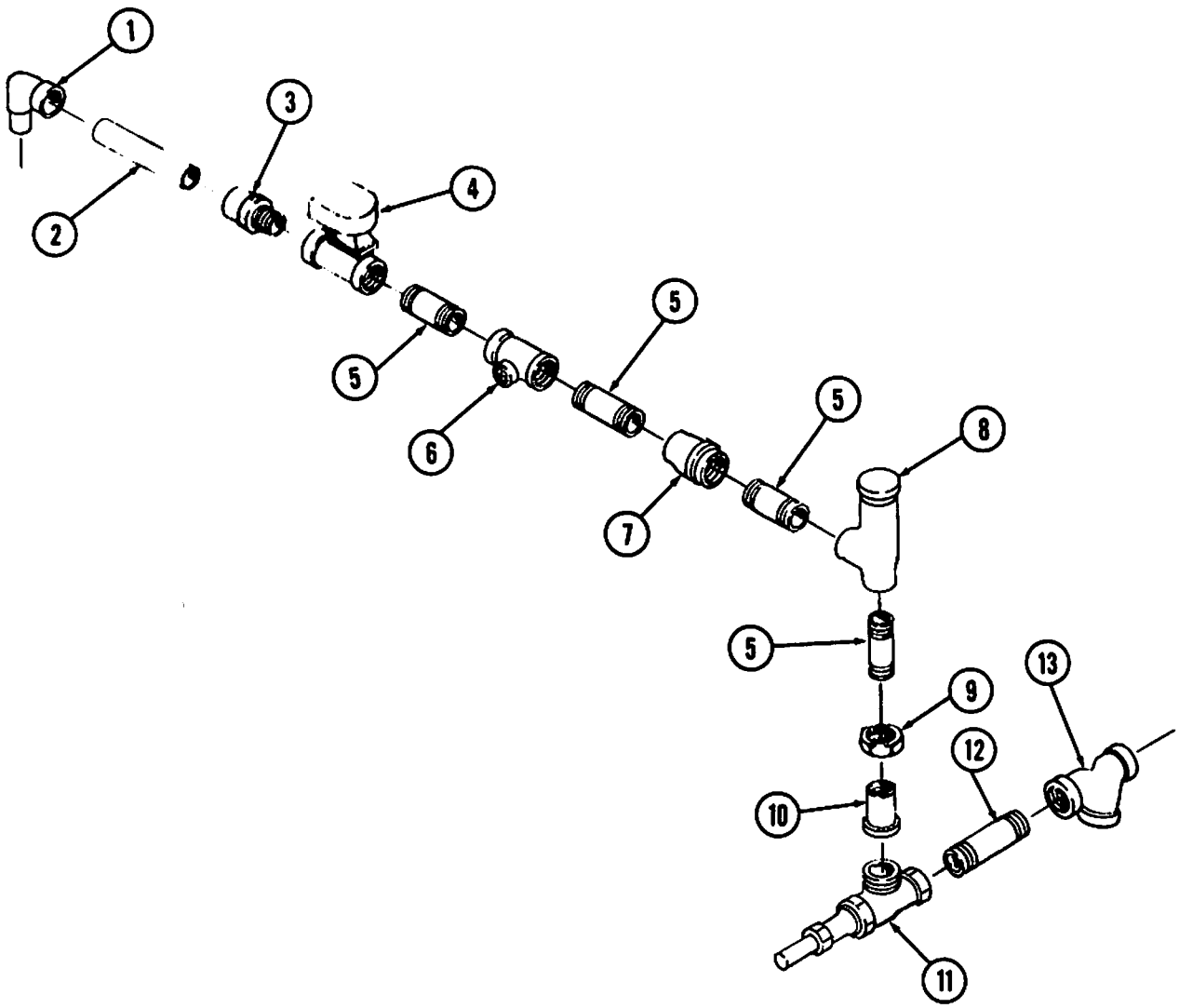


Figure 8-27. WATER SUPPLY ASSEMBLY.

FIG. & INDEX NO.	PART NUMBER		SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-27	P	136648 001		WATER SUPPLY ASSEMBLY	X
1	P	44507 091		ELL, Street, 7/8 O.D.T.	1
2	P	91238 091		TUBE, 7/8 O.D. x 4-3/8	1
3	P	91158 091		ADAPTER, 7/8 O.D.T. x 3/4 N.P.T.	1
4	P	83261 002		VALVE, Solenoid, 3/4 N.P.T. (S-7)	1
	P	764072 001		• KIT, Valve Repair	1
	P	764072 002		• COIL, 120 V. 60 Hz, 110 V. 50 Hz	1
5	P	29295 091		NIPPLE, 3/4 N.P.T. x 2-1/4	4
6	P	75040 091		TEE, 3/4 x 3/4 x 1/8 N.P.T.	1
7	P	83870 001		VALVE, Check, 3/4 N.P.T.	1
8	P	77023 001		VACUUM BREAKER, 3/4 N.P.T.	1
	P	752735 091		• KIT, Repair	1
9	P	2903 091		NUT, Union	1
10	P	4248 091		SPUD, Female, 3/4 N.P.T.	1
11	P	26907 091		VALVE, Angle, 3/4 N.P.T. (See Fig. 8-33)	1
12	P	29299 091		NIPPLE, 3/4 N.P.T. x 3-1/4	1
13	P	47708 091		STRAINER, 3/4 N.P.T.	1
	P	754616 091		• SCREEN, Stainless Steel	1

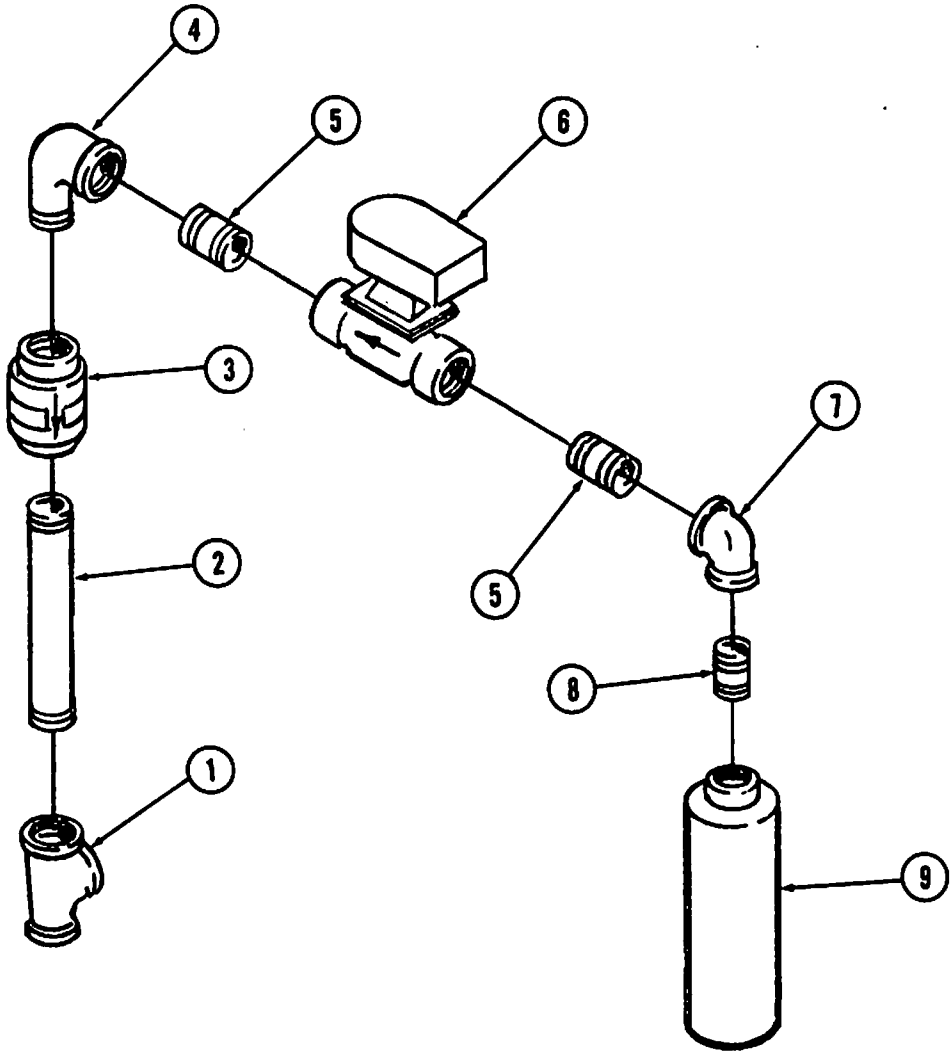


Figure 8-28. AIR BREAK ASSEMBLY.

FIG. & INDEX NO.	PART NUMBER			S V C	DESCRIPTION	UNITS PER ASSEMBLY
8-28-	P	136654	001		AIR BREAK ASSEMBLY	X
1	P	4922	091		TEE, 3/4 x 1/2 x 1/2 N.P.T.	1
2	P	29303	091		NIPPLE, 3/4 N.P.T. x 4-1/4	1
3	P	44317	091		VALVE, Check, 3/4 N.P.T.	1
	P	751769	091		• POPPET ASSEMBLY	1
4	P	1636	091		ELL, Street, 3/4 N.P.T.	1
5	P	29291	091		NIPPLE, 3/4 N.P.T. x 1-1/4	2
6	P	84444	002		VALVE, Solenoid, 3/4 N.P.T. (S-1)	1
	P	764078	001		• KIT, Valve Repair	1
	P	764078	002		• COIL, 120 V. 60 Hz, 110 V. 60 Hz	1
7	P	1625	091		ELL, 3/4 x 1/2 N.P.T.	1
8	P	29162	091		NIPPLE, 1/2 N.P.T. x 1	1
9	P	93160	001		FILTER, Air (See Fig. 8-32)	1

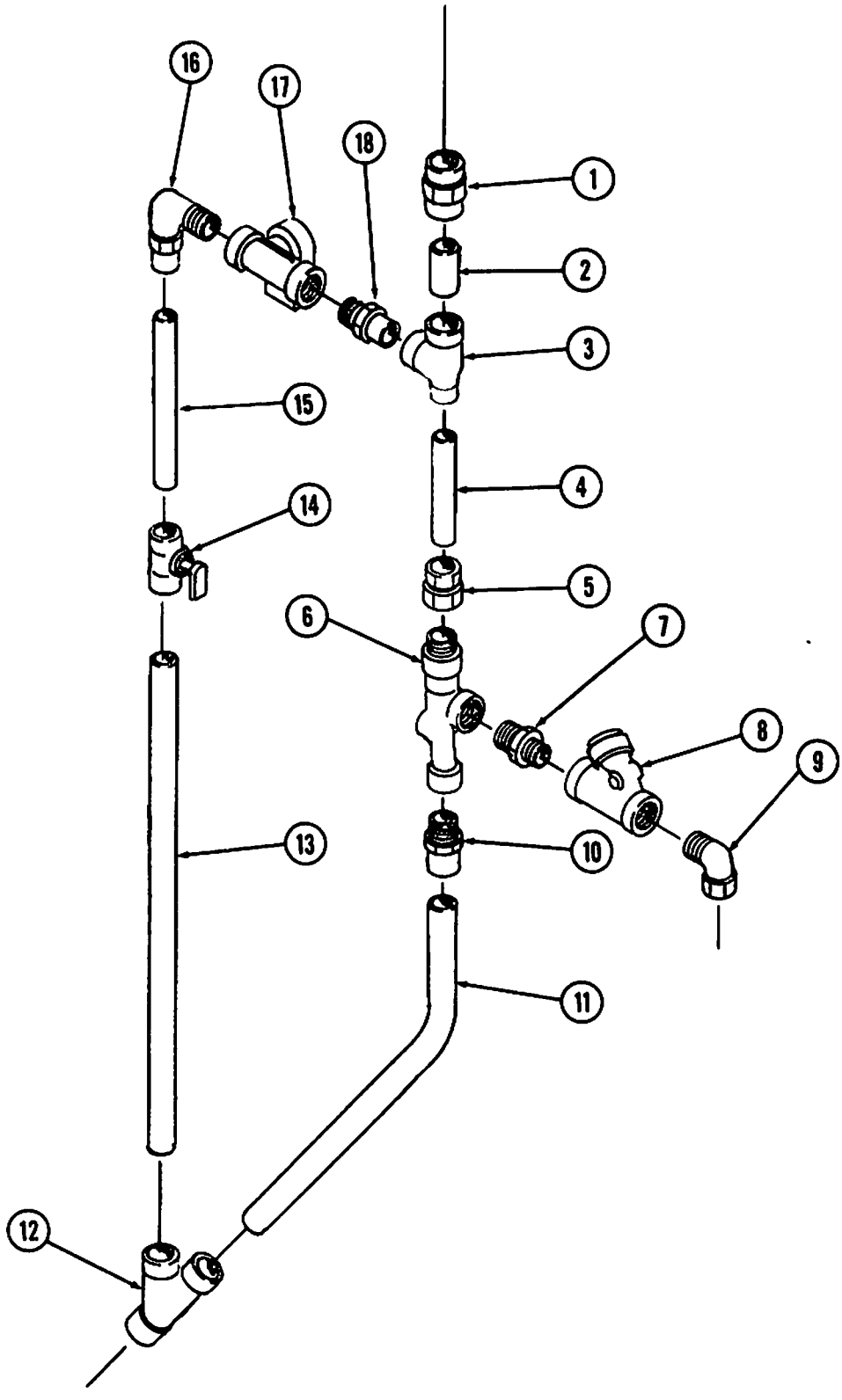


Figure 8-29. EJECTOR ASSEMBLY.

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-29-	P	136655	001		EJECTOR ASSEMBLY	X
1	P	91226	091		UNION, 7/8 O.D.T.	1
2	P	91248	091		TUBE, 7/8 O.D. x 2	1
3	P	44847	091		TEE, 7/8 x 5/8 x 7/8 O.D.T.	1
4	P	90276	091		TUBE, 5/8 O.D. x 4-3/8	1
5	P	30948	091		FITTING, 5/8 O.D.T. x 1/2 N.P.T.	1
6	P	83924	001		EJECTOR, 1/2 N.P.T.	1
7	P	84459	001		REDUCER, 1/2 x 3/8 N.P.T.	1
8	P	5424	091		VALVE, Check, 3/8 N.P.T.	1
	P	74335	091		• DISC	1
9	P	40153	091		ELL, 5/8 O.D.T. x 3/8 N.P.T.	1
10	P	91156	091		FITTING, 7/8 O.D.T. x 1/2 N.P.T.	1
11	P	84462	001		TUBE, 7/8 O.D.	1
12	P	89384	091		FITTING, "Y", 7/8 O.D.T.	1
13	P	84460	002		TUBE, 7/8 O.D. x 13	1
14	P	83629	001		BALANCER, 7/8 O.D.T.	1
15	P	84460	001		TUBE, 7/8 O.D. x 8-5/8	1
16	P	91230	091		ELL, Union, 7/8 O.D.T. x 3/4 N.P.T.	1
17	P	83261	002		VALVE, Solenoid, 3/4 N.P.T. (S-4)	1
	P	764072	001		• KIT, Valve Repair	1
	P	764072	002		• COIL, 120 V. 60 Hz., 110 V. 50 Hz	1
18	P	91159	091		FITTING, 7/8 O.D.T. x 3/4 N.P.T.	1

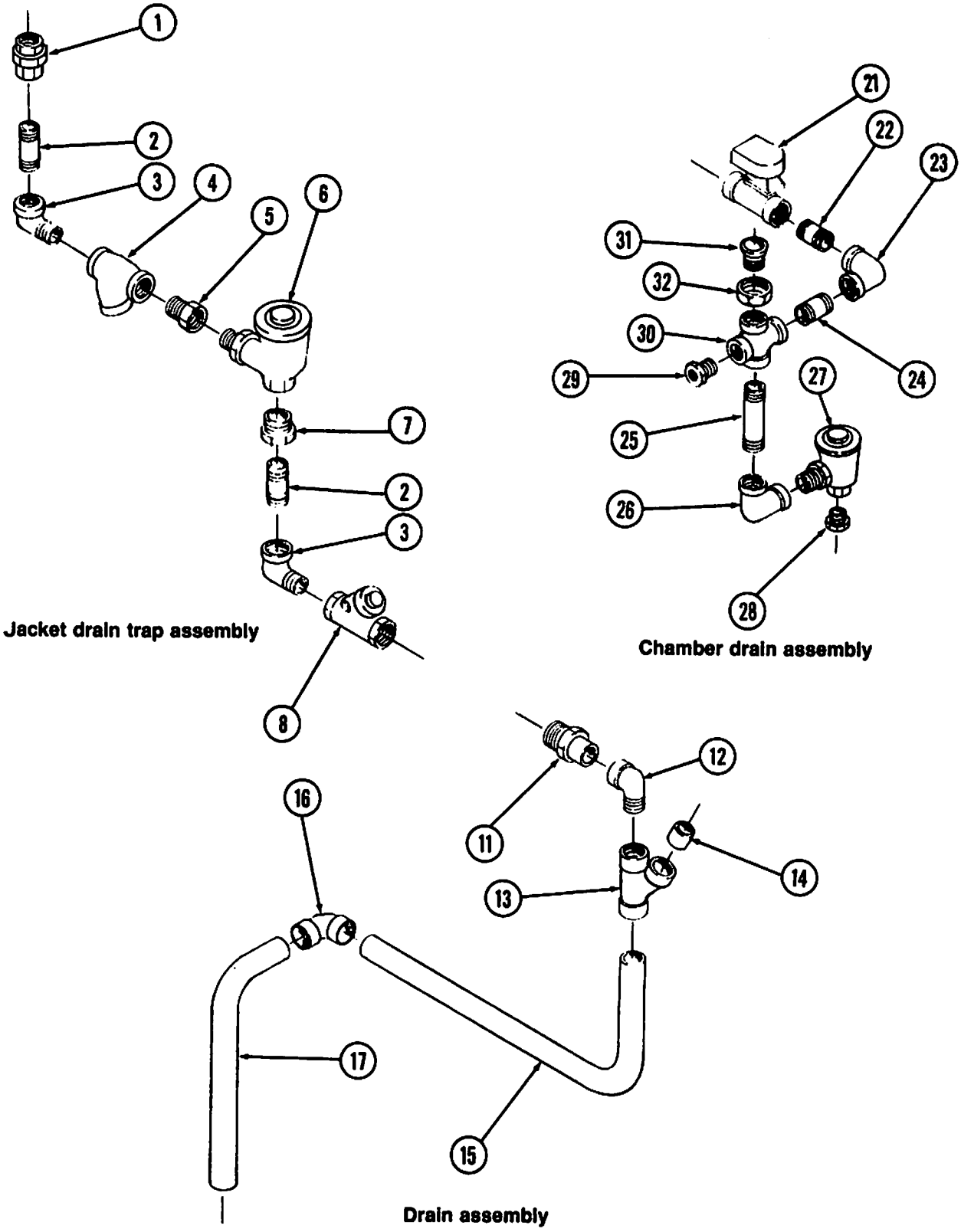


Figure 8-30. DRAIN ASSEMBLIES.

FIG. & INDEX NO.	PART NUMBER		SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-30-	P	136666 001		JACKET DRAIN TRAP ASSEMBLY	X
1	P	5266 091		UNION, 3/8 N.P.T.	1
2	P	29013 091		NIPPLE, 3/8 N.P.T. x 1	2
3	P	1631 091		ELL, Street, 3/8 N.P.T.	2
4	P	47671 091		STRAINER, 3/8 N.P.T.	1
	P	50341 091		• SCREEN	1
	P	28447 091		• "O" RING	1
5	P	79798 001		CONNECTOR, Reducing, 1/2 x 3/8 N.P.T.	1
6	P	129222 001		TRAP, Steam, 1/2 N.P.T. (See Fig. 8-34)	1
7	P	837 091		BUSHING, Reducing, 1/2 x 3/8 N.P.T.	1
8	P	5424 091		VALVE, Check, 3/8 N.P.T.	1
	P	74335 091		• DISC	1
	P	136667 001		DRAIN ASSEMBLY	X
11	P	90209 091		ADAPTER, 5/8 O.D.T. x 3/8 N.P.T.	1
12	P	90214 091		ELL, Street, 5/8 O.D.T.	1
13	P	83377 001		"Y" BRANCH, 5/8 O.D.T.	1
14	P	89808 091		COUPLING, 5/8 O.D.T. x 1/8 N.P.T.	1
15	P	92935 009		TUBE, Drain, 5/8 O.D.	1
16	P	90212 091		ELL, 5/8 O.D.T.	1
17	P	92935 010		TUBE, Drain, 5/8 O.D.	1
	P	136668 001		CHAMBER DRAIN ASSEMBLY	X
21	P	83228 002		VALVE, Solenoid, 3/4 N.P.T. (S-3)	1
	P	764070 001		• KIT, Valve Repair	1
	P	764070 002		• COIL, 120 V. 60 Hz, 110 V. 50 Hz.	1
22	P	29291 091		NIPPLE, 3/4 N.P.T. x 1-1/4	1
23	P	1637 091		ELL, Reducing, 1 x 3/4 N.P.T.	1
24	P	29356 091		NIPPLE, 1 N.P.T. x 2	1
25	P	29298 091		NIPPLE, 3/4 N.P.T. x 3	1
26	P	1625 091		ELL, Reducing, 3/4 x 1/2 N.P.T.	1
27	P	129222 001		TRAP, Steam, 1/2 N.P.T. (See Fig. 8-34)	1
28	P	76053 042		BUSHING, Reducing, 1/2 x 1/4 N.P.T.	1
29	P	6263 091		BUSHING, Reducing, 1 x 1/2 N.P.T.	1
30	P	1350 091		CROSS, 1 x 1 x 3/4 x 3/4 N.P.T.	1
31	P	2903 091		NUT, Union	1
32	P	4247 091		SPUD, Male, 3/4 N.P.T.	1

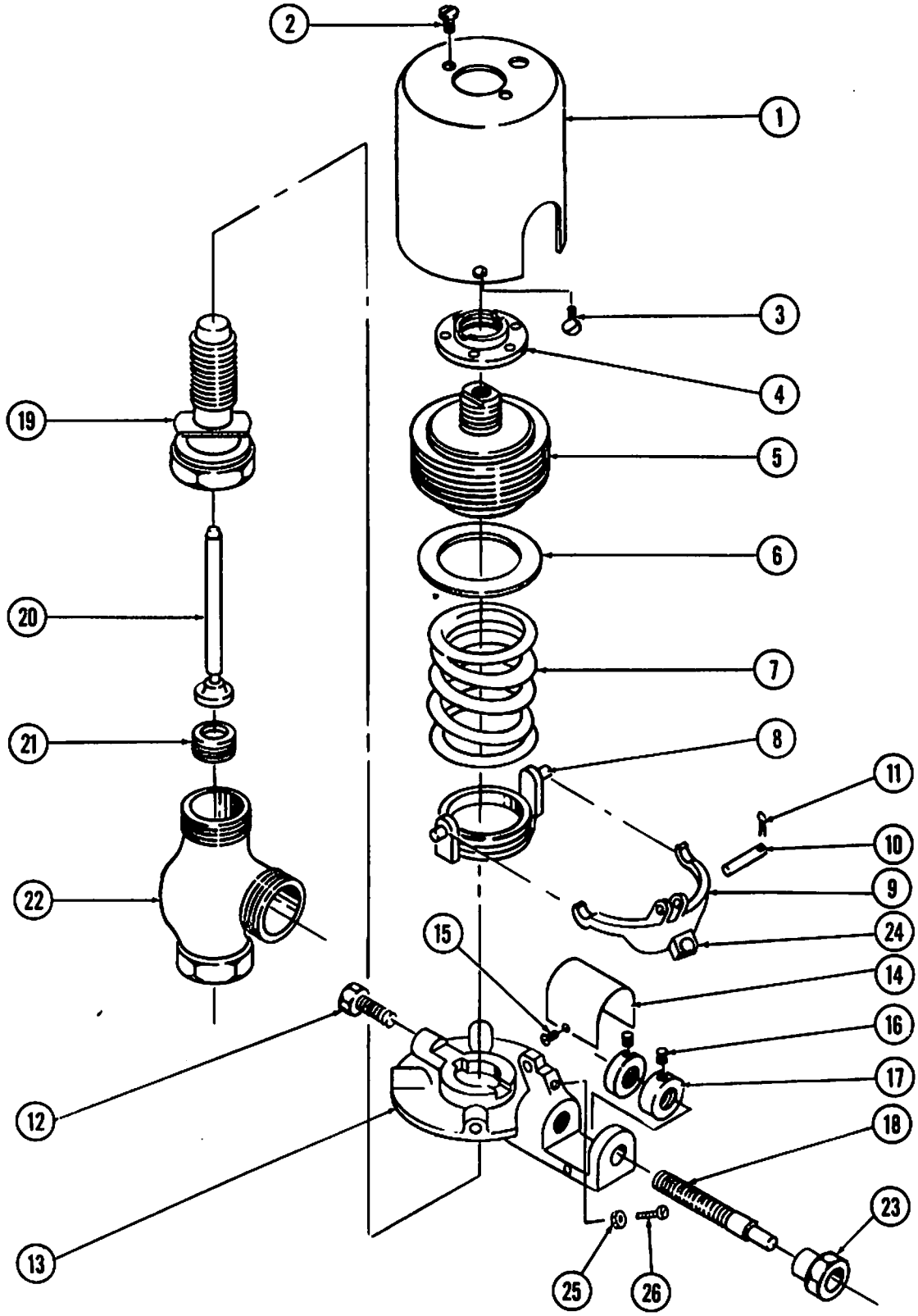


Figure 8-31. STEAM CONTROL VALVE.

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-31-	P	20661	091		STEAM CONTROL VALVE, HI-LO	X
	P	754359	001		KIT, Valve Repair	1
1	P	22349	045		COVER	1
2	P	9276	041		SCREW, #8-32 x 3/16	2
3	P	3969	041		SCREW, 1/4-20 x 1/4	4
4	P	9172	091		REINFORCEMENT	1
5	P	35880	091		BELLOWS ASSEMBLY	1
6	P	35911	061		PLATE, Top Spring	1
7	P	19947	045		SPRING	1
8	P	12474	042		PLATE, Lower Spring	1
9	P	14976	091		FORK, Adjusting	1
10	P	11890	061		PIN, Fork Pivot	1
11	P	8897	091		COTTER PIN	2
12	P	12471	041		SCREW, 1/4-20 x 1-1/2	1
13	P	20658	042		BOTTOM PLATE	1
14	P	20662	061		COVER, Adjusting Screw	1
15	P	12534	061		SCREW, #8-32 x 1/4	2
16	P	10585	041		SETSCREW, Allen Head, #10-32 x 1/4	2
17	P	20659	091		LOCK NUT,	2
18	P	20657	061		SCREW, Adjusting	1
19	P	26836	091		SYLPHON AND BONNET ASSEMBLY	1
20	P	28265	091		VALVE STEM ASSEMBLY	1
21	P	5685	061		SEAT, Valve	1
22	P	5669	091		BODY, Valve	1
23	P	8605	043		NUT, Wheel	1
24	P	2299	045		INSERT	1
25	P	2959	041		NUT	1
26	P	9315	041		SCREW	1

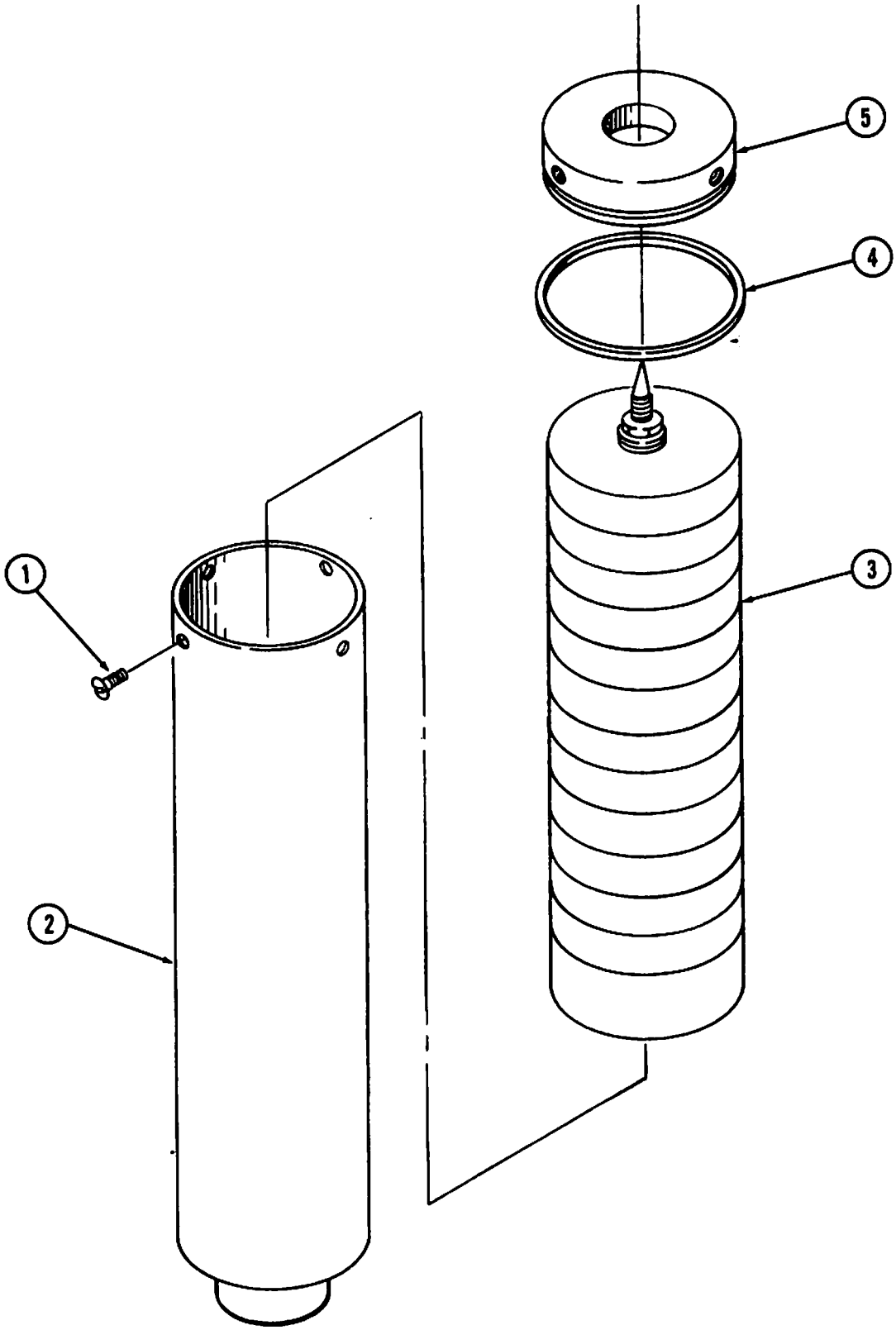


Figure 8-32. FILTER ASSEMBLY.

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-32-	P 93160 001		FILTER ASSEMBLY	X
1	P 12283 041		SCREW, Round Head, #10-32 x 1/4	4
2	P 93159 001		TUBE ASSEMBLY	1
3	P 23953 091		CARTRIDGE, Filter	1
4	P 41301 091		"O" RING	1
5	P 83900 001		HEAD	1

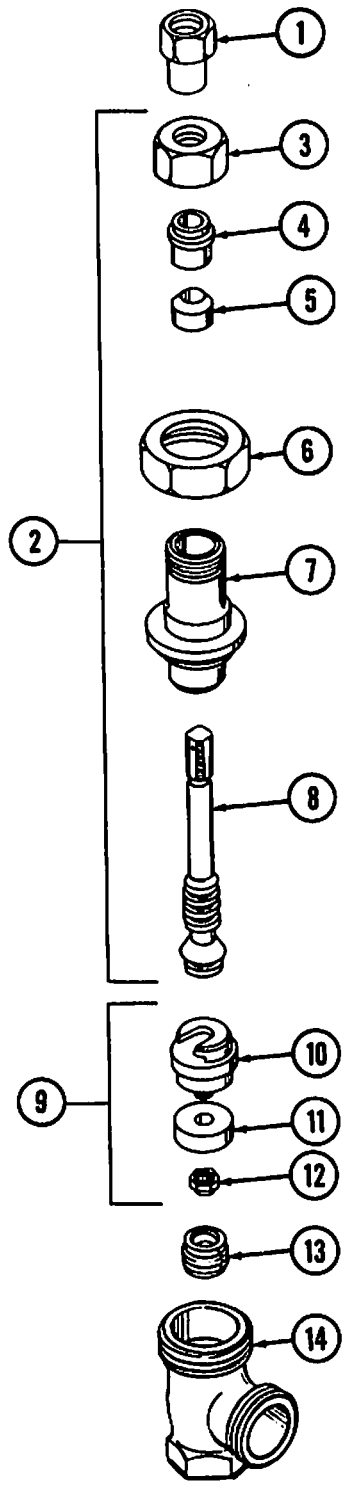


Figure 8-33. UNION ANGLE VALVE.

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY			
8-33-	P	5654	091		UNION ANGLE VALVE: Steam Supply, 3/8	X			
	P	26907	091		UNION ANGLE VALVE: Water Supply, 3/4		X		
	P	754361	001		KIT, Repair, 3/8 N.P.T.	1			
	P	754361	003		KIT, Repair, 3/4 N.P.T.		1		
1	P	8605	051		NUT, Wheel	1	1		
2	P	53915	091		VALVE STEM AND BONNET ASSEMBLY	1			
	P	53917	091		VALVE STEM AND BONNET ASSEMBLY		1		
3	P	48431	091		• NUT, Packing	1	1		
4	P	48432	091		• GLAND, Packing	1	1		
5	P	8784	091		• PACKING	1	1		
6	P	5683	091		• NUT, Bonnet	1			
	P	25566	091		• NUT, Bonnet		1		
7	P	53912	091		• BONNET, Valve	1			
	P	53913	091		• BONNET, Valve		1		
8	P	53911	091		• STEM, Valve	1	1		
9	P	25347	091		DISC HOLDER ASSEMBLY	1			
	P	25567	091		DISC HOLDER ASSEMBLY		1		
10	P	150576	001		• DISC HOLDER	1			
	P	25568	091		• DISC HOLDER		1		
11	P	25345	091		• DISC, Teflon	1			
	P	25569	091		• DISC, Teflon		1		
12	P	5680	091		• NUT, Disc	1			
	P	2927	091		• NUT, Disc		1		
13	P	5685	061		SEAT, Valve	1			
	P	22425	061		SEAT, Valve		1		
14	P	5669	091		BODY, Valve	1			
	P	22427	091		BODY, Valve		1		

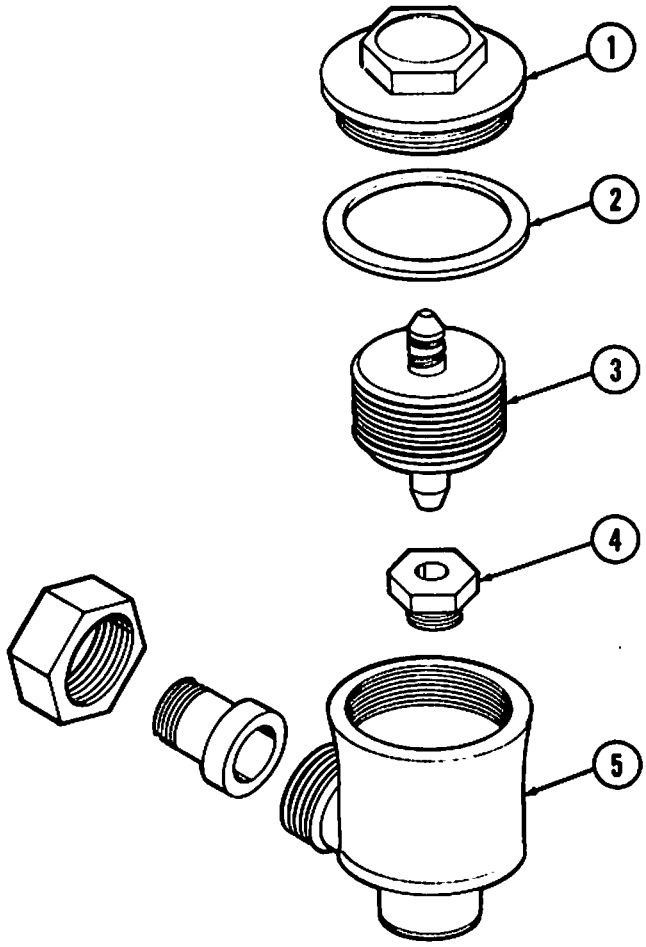


Figure 8-34. STEAM TRAP.

FIG. & INDEX NO.	PART NUMBER	SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-34-	P 129222 001		STEAM TRAP	1
	P 764080 001		KIT, Repair, 1/2 N.P.T. (incl. items 2, 3, 4)	1
1	764315 209		CAP	1
2	764315 208		GASKET	1
3	764315 207		DIAPHRAGM ASSEMBLY	1
4	764315 206		SEAT	1
5			BODY	1

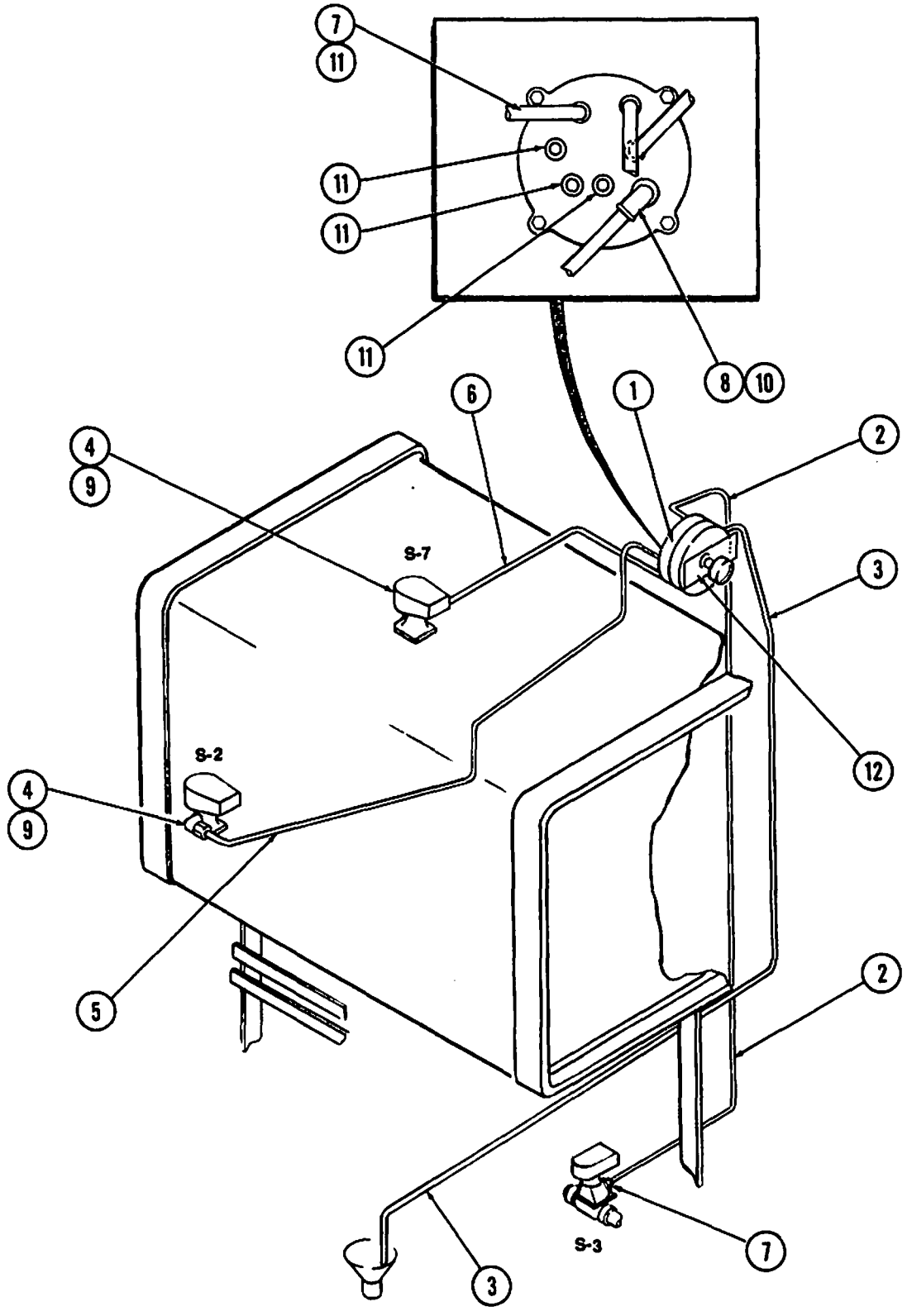


Figure 8-35. OPTIONAL MANUAL VALVE PIPING.

FIG. & INDEX NO.	PART NUMBER		SVC	DESCRIPTION	UNITS PER ASSEMBLY			
8-35-				OPTIONAL MANUAL VALVE PIPING: 16x16 Vacamatic	X			
				OPTIONAL MANUAL VALVE PIPING: 20x20 Vacamatic		X		
1	P	136726 001		VALVE, Manual Multiport (See Fig. 8-36)	1	1		
2				TUBE, S-3, 1/4 O.D. x 52	1			
				TUBE, S-3, 1/4 O.D. x 58		1		
3				TUBE, Drain, 3/8 O.D. x 62	1	1		
4	P	42510 091		ELL, Compression, 1/4 O.D.T. x 1/8 N.P.T.	2	2		
5				TUBE, S-2, 1/4 O.D. x 50-17/64	1			
				TUBE, S-2, 1/4 O.D. x 66-17/64		1		
6				TUBE, S-7, 1/4 O.D. x 12	1			
				TUBE, S-7, 1/4 O.D. x 12		1		
7	P	43289 091		FITTING, Compression, 1/4 O.D.T. x 1/8 N.P.T.	4	4		
8	P	45530 091		ELL, Compression, 3/8 O.D.T. x 3/8 N.P.T.	1	1		
9	P	84371 001		INSERT, Tube, 1/4 (Not Shown)	6	6		
10	P	84371 002		INSERT, Tube, 3/8 (Not Shown)	1	1		
11	P	3439 091		PLUG, Pipe	6	6		
				TUBING, Synflex, 1/4 O.D. x 146	1			
				TUBING, Synflex, 1/4 O.D. x 132		1		
				TUBING, Synflex, 3/8 O.D. x 69	1			
				TUBING, Synflex, 3/8 O.D. x 73		1		
12	P	136727 001		DECAL, Manual	1	1		

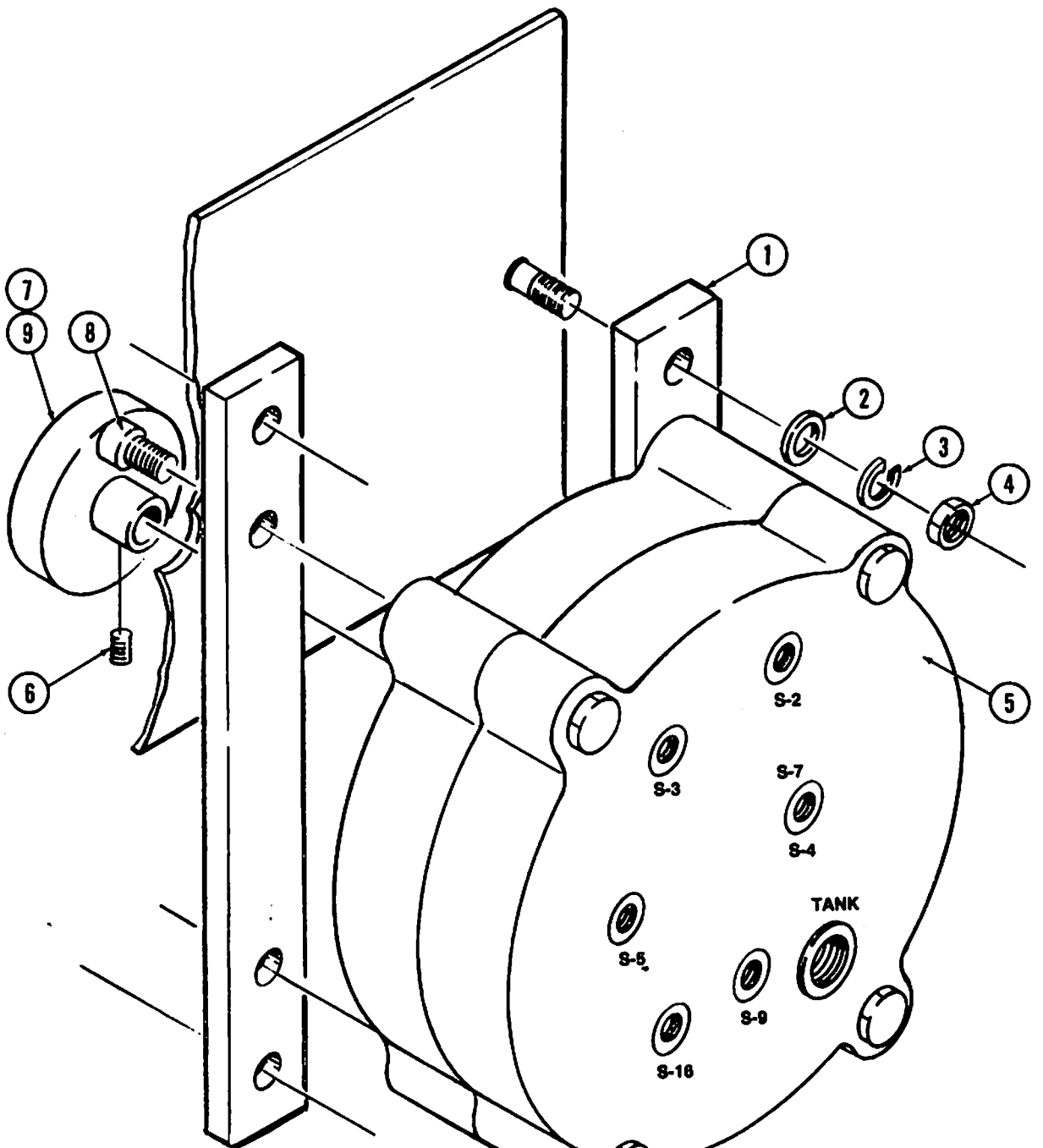


Figure 8-36. OPTIONAL MANUAL VALVE.

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-36-					OPTIONAL MANUAL VALVE	X
1	P	129061	001		PLATE, Mounting	2
2	P	10445	091		WASHER, Flat	4
3	P	19678	045		LOCKWASHER	4
4	P	3097	041		NUT, Hex	4
5	P	136726	001		VALVE, Manual Multi-Port	1
6	P	42617	045		SCREW, Set	1
7	P	136760	001		KNOB, Selector	1
8	P	79253	045		SCREW, Socket Head, 1/4-20 x 1/2	4
9	P	129060	001		INSERT, Knob	1

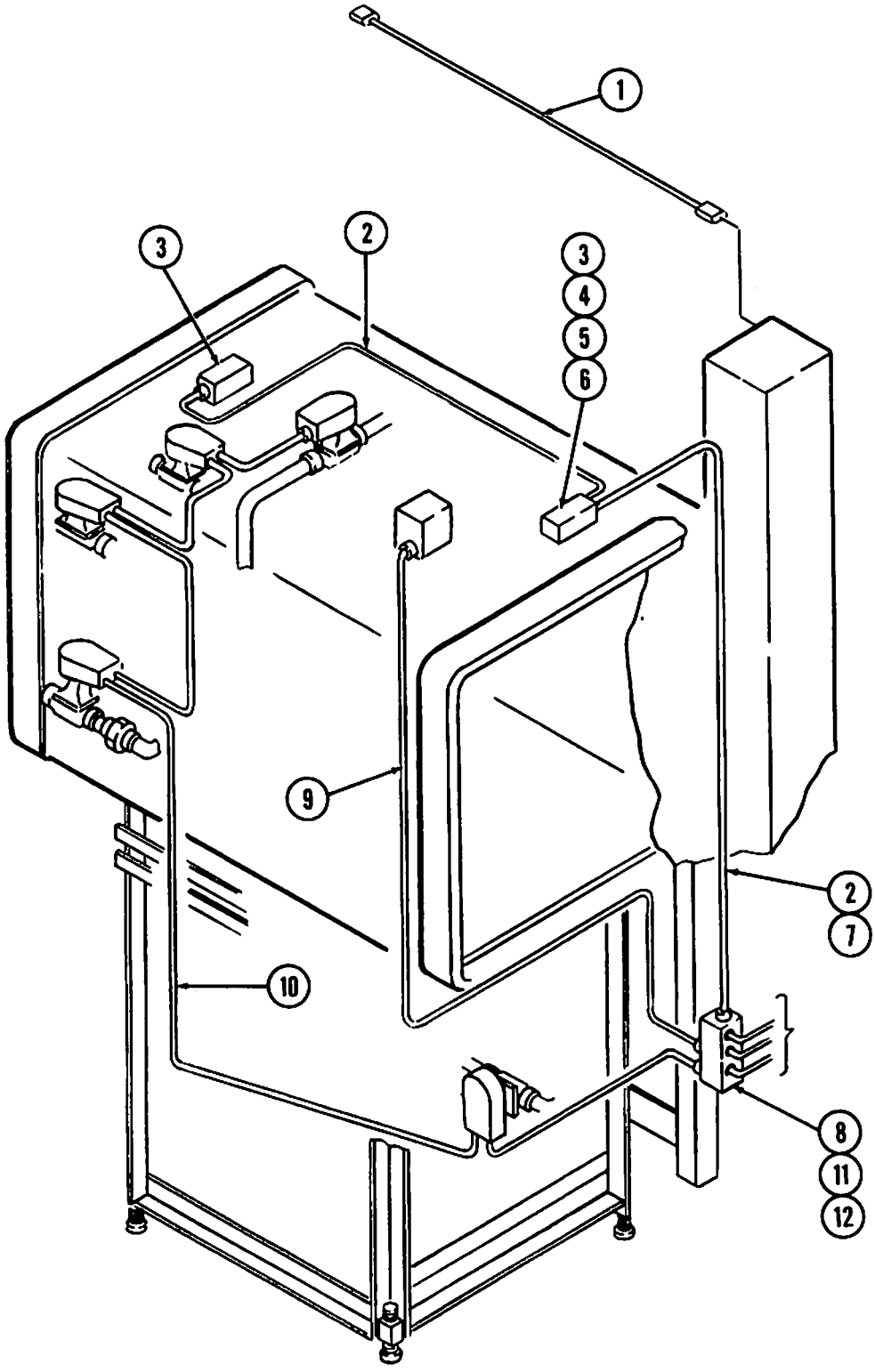


Figure 8-37. WIRING ASSEMBLY.

FIG. & INDEX NO.	PART NUMBER		SVC	DESCRIPTION	UNITS PER ASSEMBLY			
8-37-				WIRING ASSEMBLY: Single Door Models	X			
				WIRING ASSEMBLY: Double Door Models		X		
1	P	136752	001	HARNESS ASSEMBLY (See Fig. 8-43)		1		
2	P	136548	001	CABLE, Door Switch, Double Door (See Fig. 8-40)		1		
3	P	136475	001	ASSEMBLY, Door Switch (See Fig. 8-21)	1	2		
4	P	90168	045	SCREW, Hex Head, Self Tapping, #10 x 5/16	2	4		
5	P	90891	045	EXTENSION, Switch	1	2		
6	P	4682	041	SCREW, Round Head, #8-32 x 3/8	2	4		
7	P	93643	001	CABLE, Door Switch, Single Door (See Fig. 8-39)	1			
8	P	93617	001	BOX, Junction (See Fig. 8-38)	1	1		
9	P	93645	001	CABLE, Pressure and Vacuum Switch (See Fig. 8-41)	1	1		
10	P	136549	001	CABLE, Solenoid (See Fig. 8-42)	1	1		
11	P	15361	042	SCREW, Round Head, #10-32 x 1/4	2	2		
12	P	31705	045	LOCKWASHER, #10	2	2		

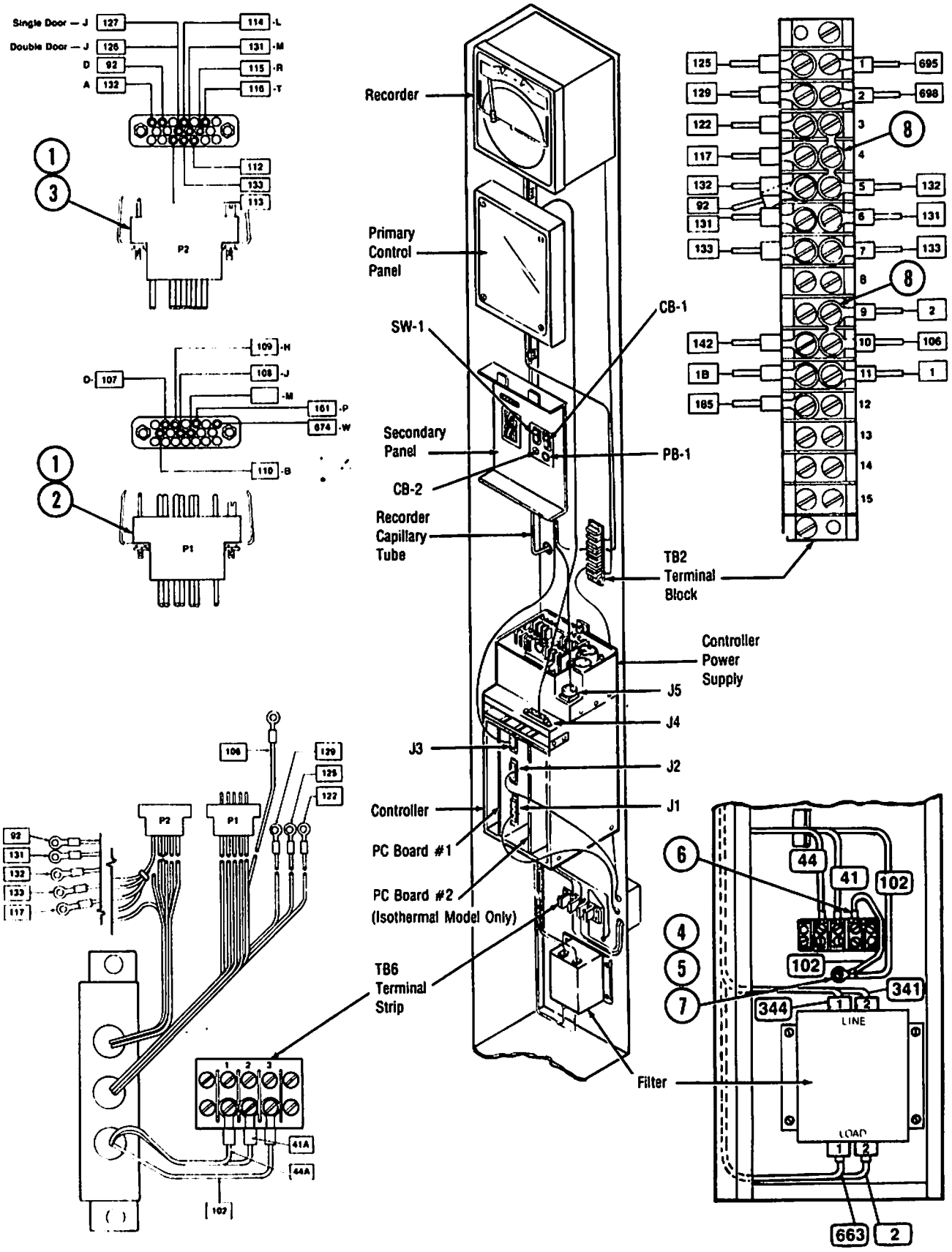
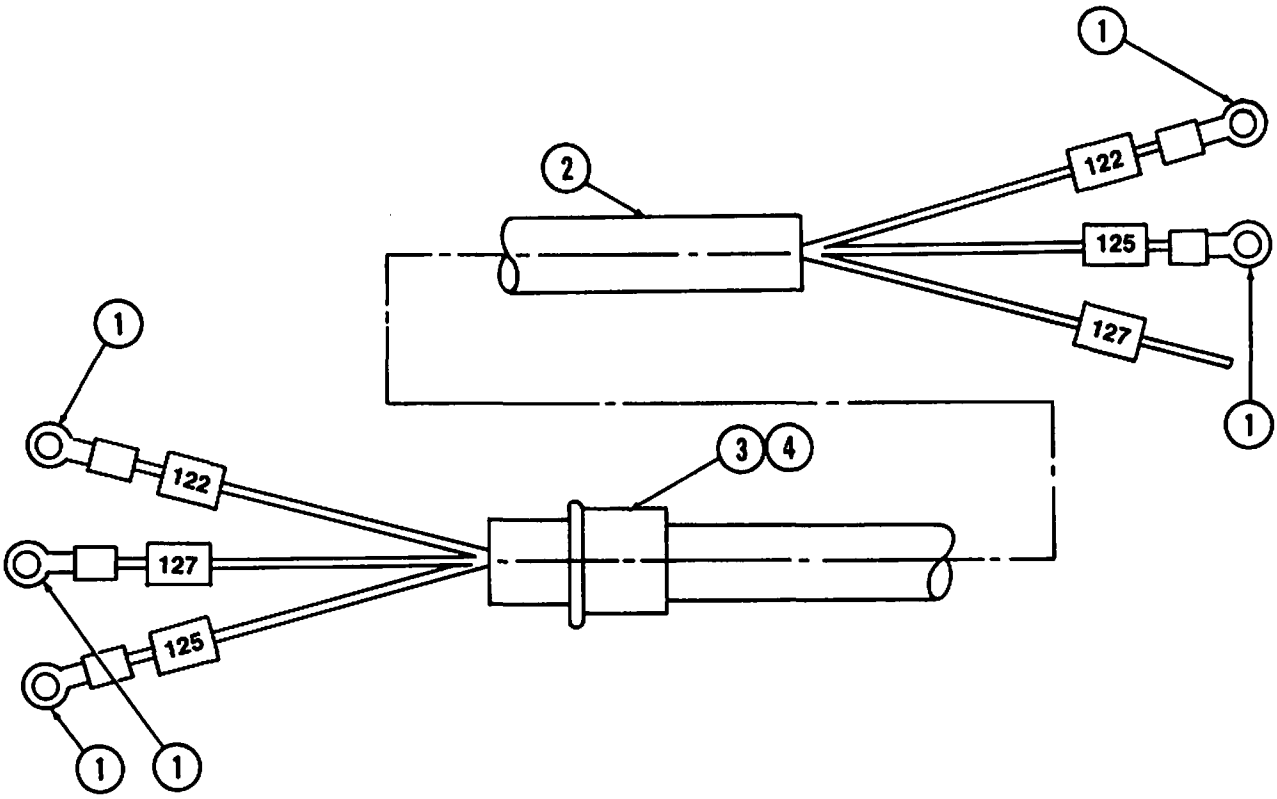


Figure 8-38. CONNECTION DETAILS: Control Column.

FIG. & INDEX NO.	PART NUMBER		SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-38-	P	146341 001		CONNECTION DETAILS: Control Column	X
1	P	93829 001		BLOCK, P1 and P2	2
2	P	84352 001		PIN, Contact, J-1	7
3	P	84352 002		SOCKET, Contact, J-2	11
4	P	19522 091		TERMINAL, Wire, #10 Ring x 16-22 AWG	1
5	P	82675 001		SCREW, Green, Ground, #10-32 x 3/8	1
6	P	14865 091		TERMINAL, Wire, #8 Ring x 18-22 AWG	1
7				WIRE, Green	1
8	P	91945 041		JUMPER	3



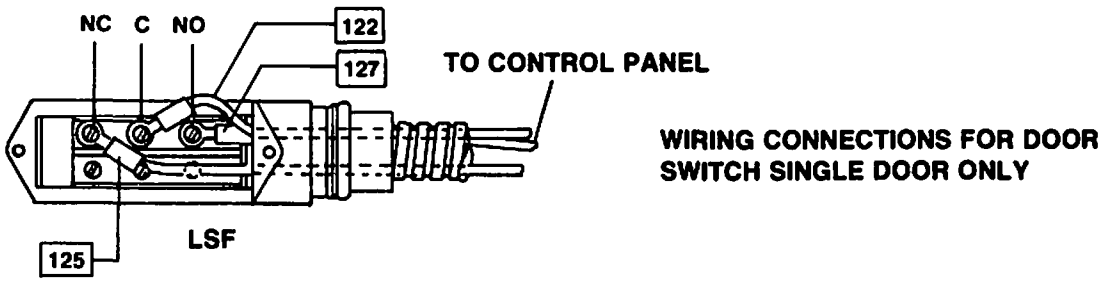


Figure 8-39. DOOR SWITCH CABLE ASSEMBLY (Single Door Models)

FIG. & INDEX NO.	PART NUMBER			S V C	DESCRIPTION	UNITS PER ASSEMBLY
8-39-	P	93643	001		CABLE ASSEMBLY: Door Switch (Single Door Models)	X
1	P	90619	091		TERMINAL, Wire, #6 Ring	5
2	P	90609	091		CONDUIT, Flexible, 3/8 Dia. x 73	1
3	P	24748	091		BUSHING	2
4	P	90331	091		CONNECTOR, Straight	1

WIRE CHART

WIRE	COLOR	SIZE AWG	LENGTH (Inches)
122	Violet		111
127	Red		102
125	Red		111

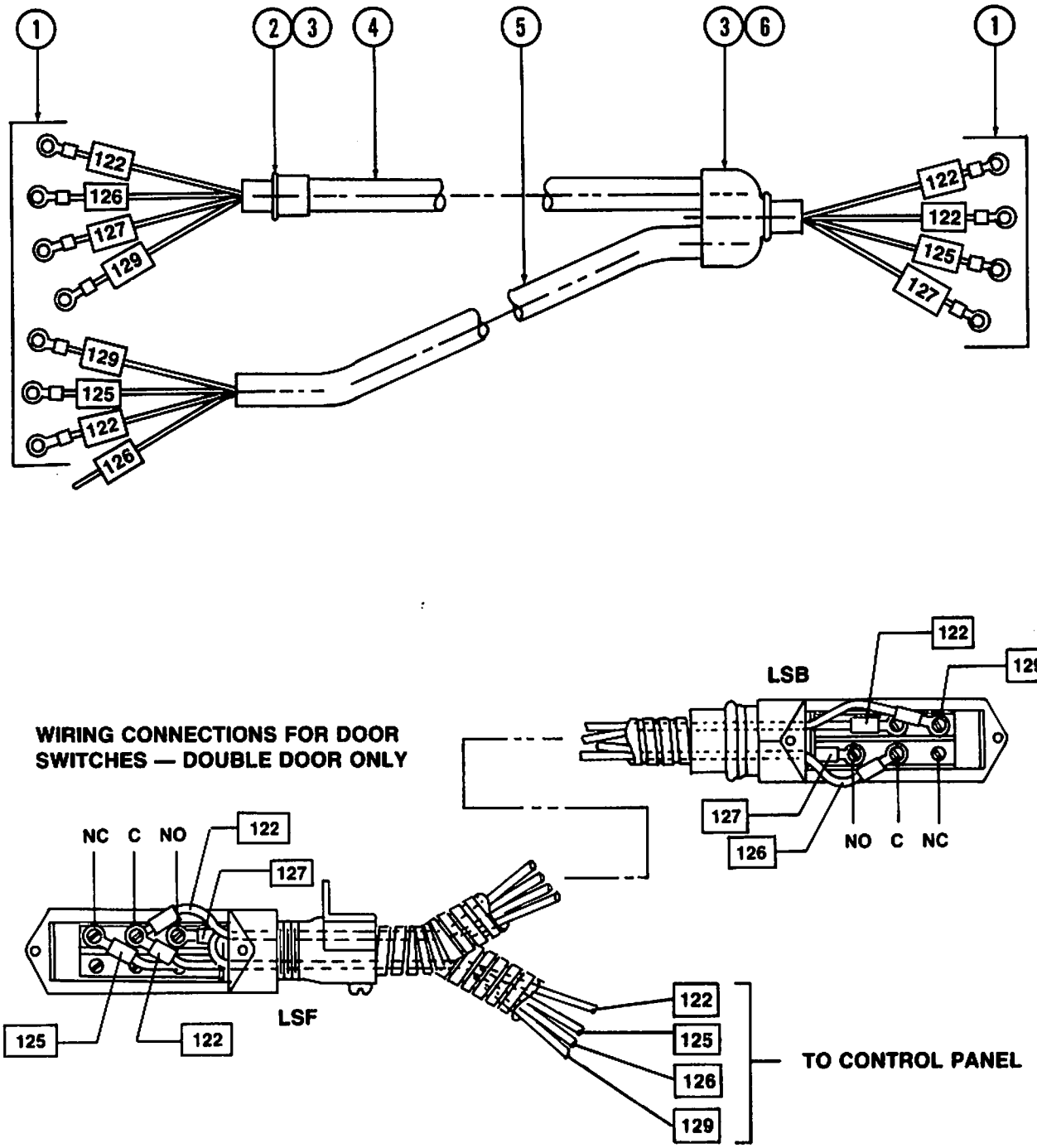


Figure 8-40. DOOR SWITCH CABLE ASSEMBLY (Double Door Models).

FIG. & INDEX NO.	PART NUMBER		SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-40-	P	136548 001		CABLE ASSEMBLY DOOR SWITCH: Double Door Models	X
1	P	90619 091		TERMINAL, Wire, #6 Ring	11
2	P	90331 091		CONNECTOR, Straight, 3/8	1
3	P	24748 091		BUSHING	6
4	P	79337 091		CONDUIT, Flexible, 3/8 Dia. x 42	1
5	P	90609 091		CONDUIT, Flexible, 3/8 Dia. x 73	1
6	P	18000 091		CONNECTOR, Double, 3/8	1

WIRE CHART

WIRE	COLOR	SIZE AWG	LENGTH (Inches)
122	Violet	18	50
122	Violet	18	111
125	Red	18	111
126	Red	18	146
127	Red	18	50
129	Red	18	155

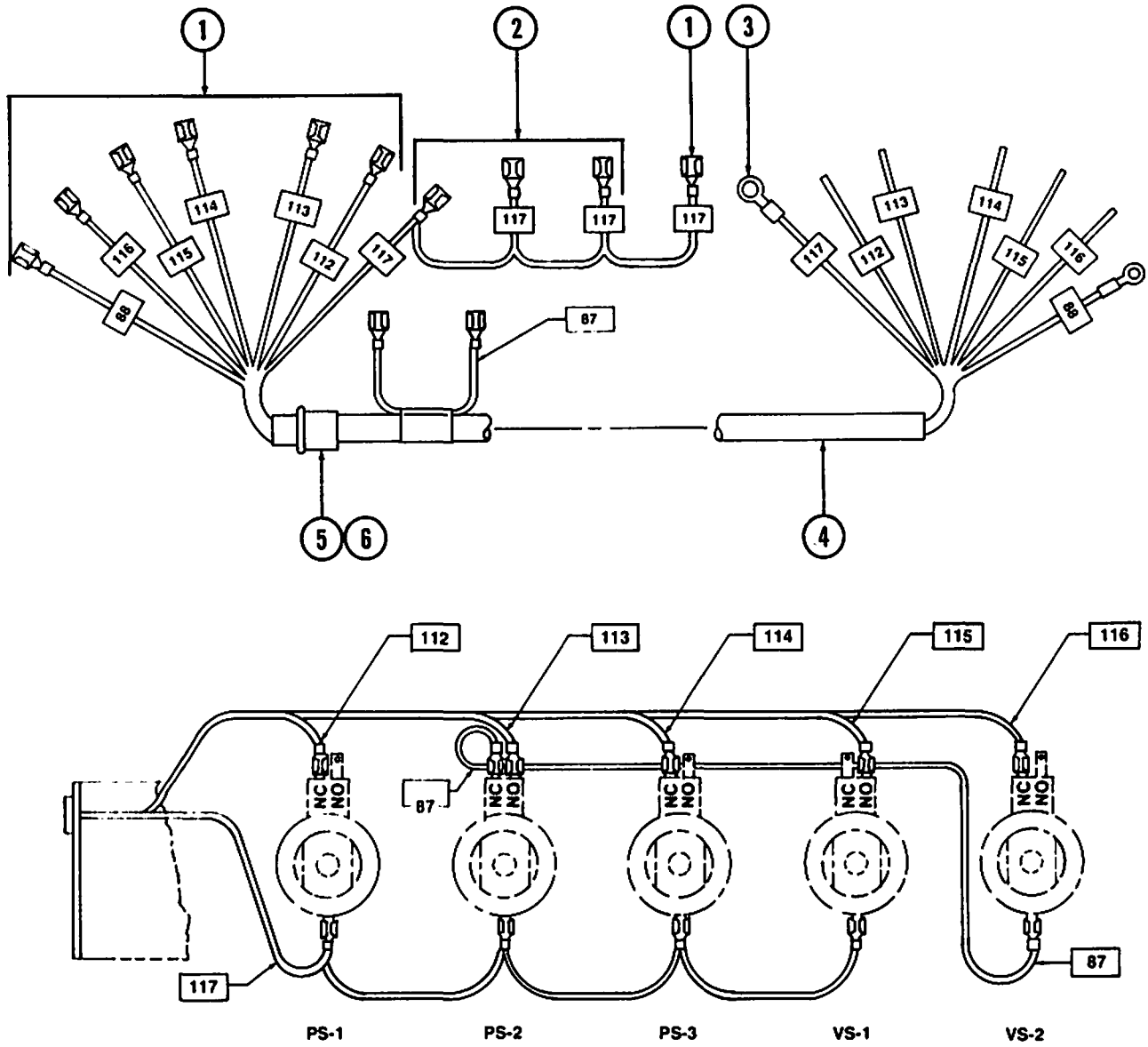


Figure 8-41. CABLE ASSEMBLY: Pressure and Vacuum Switches.

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-41-	P	93645	001		CABLE ASSEMBLY: Pressure and Vacuum Switches	X
1	P	90695	091		TERMINAL, 0.250 x 18-22 AWG	8
2	P	79437	091		TERMINAL, 0.250 x 12-14 AWG	3
3	P	90619	091		TERMINAL, #6 Ring	1
4	P	89878	091		CONDUIT, Flexible, 1/2 x 75	1
5	P	150030	001		CONNECTOR, Straight, 1/2	1
6	P	150122	001		BUSHING	2

WIRE CHART

WIRE	COLOR	SIZE AWG	LENGTH (Inches)
87	Brown	18	14
112	Brown	18	135
113	Brown	18	130
114	Brown	18	125
115	Brown	18	130
116	Brown	18	135
117	Violet	18	141
117	Violet	18	6
117	Violet	18	6
117	Violet	18	6

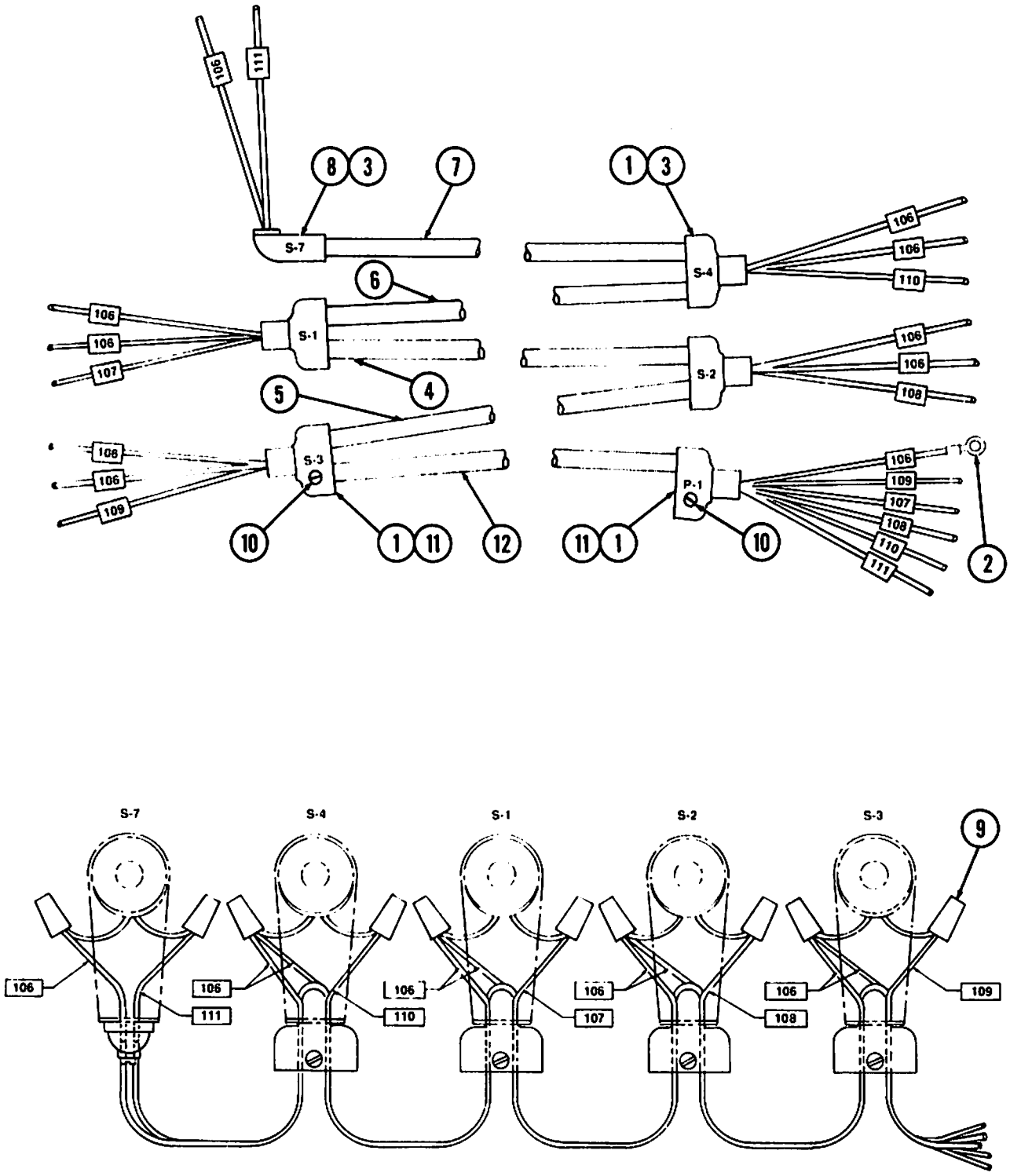


Figure 8-42. CABLE ASSEMBLY: Solenoid Valves.

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-42-	P	136549	001		CABLE ASSEMBLY: Solenoid Valve	X
1	P	18000	091		CONNECTOR, Double, 3/8	5
2	P	90619	091		TERMINAL, Wire, #6 Ring	1
3	P	24748	091		BUSHING, 3/8	16
4	P	89867	091		CONDUIT, Flexible, 3/8 Dia. x 24	2
5	P	91666	091		CONDUIT, Flexible, 3/8 Dia. x 50	1
6	P	91859	091		CONDUIT, Flexible, 3/8 Dia. x 32	1
7	P	90602	091		CONDUIT, Flexible, 3/8 Dia. x 18	1
8	P	90625	091		CONNECTOR, Ell, 3/8	1
9	P	18538	091		NUT, Wire	10
10	P	31697	041		SCREW, #10-24 x 1-1/4	2
11	P	150122	001		BUSHING, 1/2	4
12	P	31697	041		CONDUIT, Flexible, 1/2 Dia. x 24	1

WIRE CHART

WIRE	COLOR	SIZE AWG	LENGTH (Inches)
106	White S-7 to S-4	18	26
106	White S-4 to S-1	18	40
106	White S-1 to S-2	18	32
106	White S-2 to S-3	18	58
106	White S-3 to P-1	18	63
107	Yellow S-1 to P-1	18	132
108	Yellow S-2 to P-1	18	106
109	Yellow S-3 to P-1	18	54
110	Yellow S-4 to P-1	18	166
111	Yellow S-7 to P-1	18	186

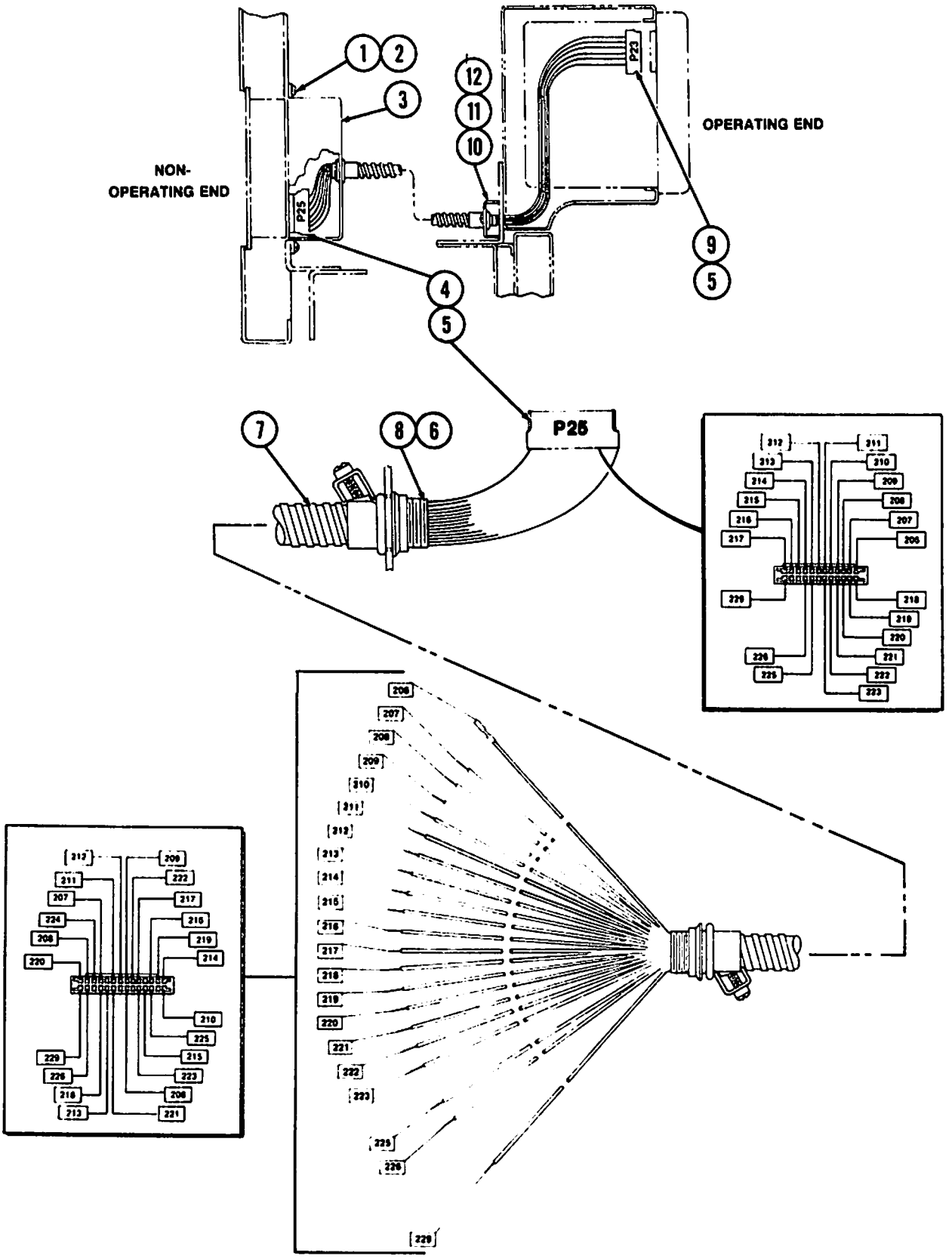


Figure 8-43. HARNESS ASSEMBLY.

FIG. & INDEX NO.	PART NUMBER		SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-43-	P	136752 001		HARNESS ASSEMBLY: Primary Panel, Double Door	X
1	P	15361 042		SCREW, Round Head, #10-32 x 1/4	2
2	P	31705 045		LOCKWASHER	2
3	P	129130 001		BRACKET, Mounting	1
4	P	84229 005		HOUSING, Receptacle, P-25	1
5	P	84187 002		CONTACT	48
6	P	150030 001		CONNECTOR, Straight, 1/2	2
7	P	91666 091		CONDUIT, Flexible, 1/2 x 50	1
8	P	150122 001		BUSHING, Anti-Short	2
9	P	84229 006		HOUSING, Receptacle, P-23	1
10	P	129084 001		BOX, Adapter	1
11	P	3985 041		SCREW, Round Head, #6-32 x 3/4	2
12	P	18131 091		LOCKWASHER, #6	2

WIRE CHART

WIRE	COLOR	SIZE AWG	LENGTH (Inches)
206	Gray	22	70
207	Gray	22	70
208	Gray	22	70
209	Gray	22	70
210	Gray	22	70
211	Gray	22	70
212	Gray	22	70
213	Gray	22	70
214	Gray	22	70
215	Gray	22	70
216	Gray	22	70
217	Gray	22	70
218	Gray	22	70
219	Gray	22	70
220	Gray	22	70
221	Gray	22	70
222	Gray	22	70
223	Gray	22	70
225	Gray	22	70
226	Gray	22	70
229	Gray	22	70

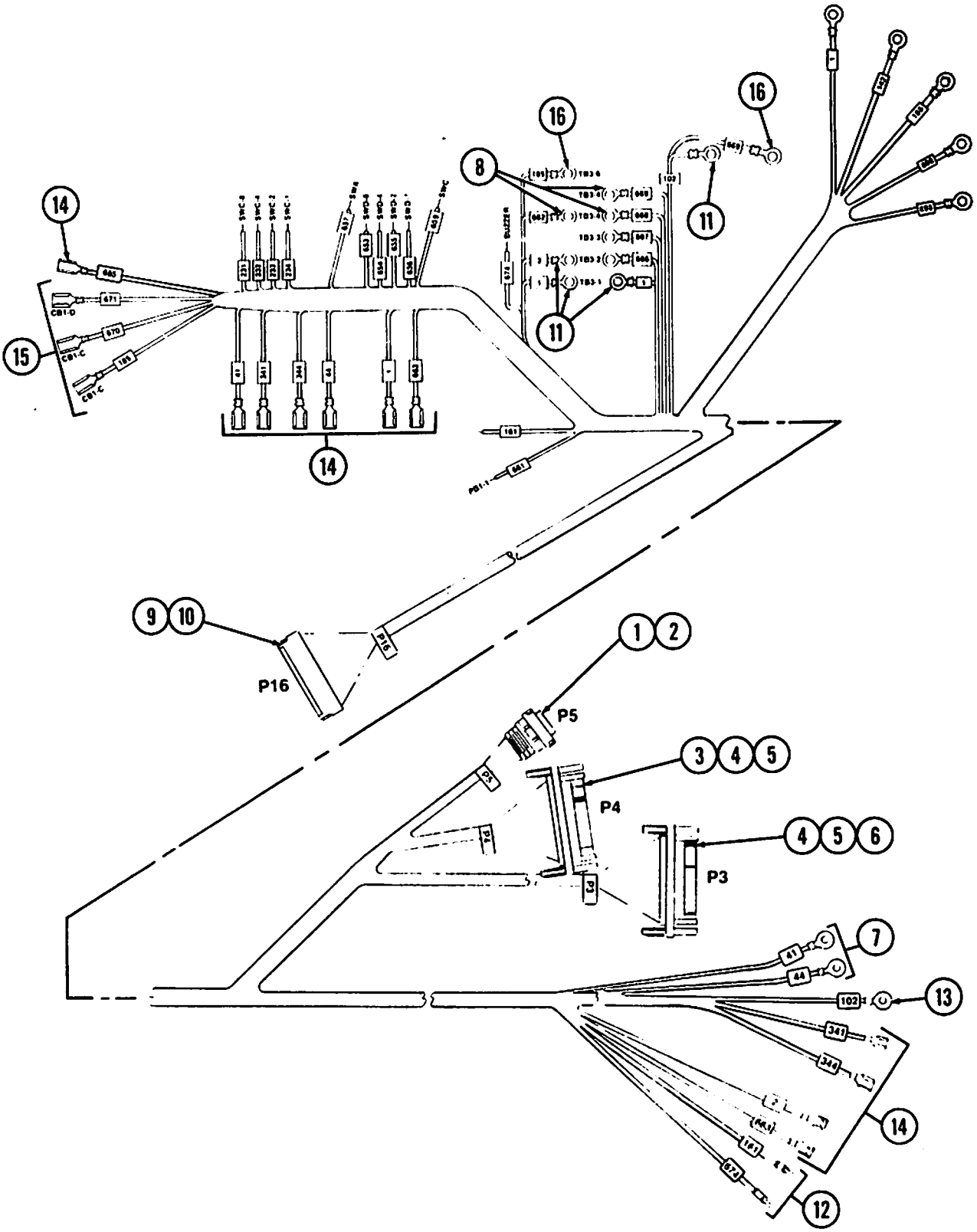


Figure 8-44. WIRING HARNESS. Secondary Panel.

FIG. & INDEX NO.	PART NUMBER		SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-44				WIRING HARNESS: Secondary Panel	X
1	P	93838 001		PLUG, 9-Position, P5	1
3	P	84352 002		CONTACT, Socket, P5	5
3	P	84205 002		HOUSING, Pin 38-Position, P4	1
4	P	84207 002		PIN, Contact, P3 and P4	43
5	P	84192 001		JACK SCREW, Female, P3 and P4	4
6	P	84205 001		HOUSING, Pin, 28-Position, P3	1
7	P	14591 091		TERMINAL, Wire, #8 Ring x #14-16 Wire	2
8	P	84378 001		TERMINAL, Wire, #6 Ring x #24 Wire	5
9	P	84229 002		HOUSING, Connector, 36-Position, P16	1
10	P	84187 002		CONTACT, P-16	34
11	P	14590 091		TERMINAL, Wire, #6 Ring x #14-16 Wire	5
-12	P	84352 001		PIN, Contact	2
13	P	14592 091		TERMINAL, #10 Ring x 14-16 AWG	1
14	P	32119 091		RECEPTACLE, 1/4 Lug x 14-16 AWG	11
15	P	90695 091		RECEPTACLE, 1/4 Lug x 18-22 AWG	3
16	P	19521 091		TERMINAL, #6 Stud x 16-22 AWG	9

WIRE CHART

WIRE	COLOR	SIZE AWG	LENGTH (Inches)
1	Black	14	7-1/2
1	Black	14	15
2	White	14	63-1/2
41	White	14	53-1/2
44	Black	14	53-1/2
102	Green	14	48
119	White	18	2-3/4
120	White	18	
142	White	18	11
161	Black	18	49-1/2
185	Black	18	13
185	Black	18	13-1/2
230	Black	24	60-1/2
231	Black	24	30-1/4
232	Black	24	29
233	Black	24	29
234	Black	24	29-3/4
245	Black	24	3-1/4
246	Black	24	3-1/4
247	Black	24	3-1/4
248	Black	24	3-1/4
341	White	14	47
344	Black	14	45
649	Black	24	3-1/4
650	Black	24	3-1/4
651	Black	24	3-1/4
652	Black	24	3-1/4
653	Black	24	37-1/2
654	Black	24	37-3/4
655	Black	24	37-1/2
656	Black	24	37
657	Black	24	29-1/4
659	Black	24	28-1/2
661	Black	24	22-1/2
662	Black	24	25
663	Black	14	63
664	Black	16	4
665	Black	16	30
666	Black	16	23

WIRE CHART

WIRE	COLOR	SIZE AWG	LENGTH (Inches)
669	Green	16	24-1/4
670	Black	18	30
671	Black	18	30
674	Black	18	54
675	Black	24	60-1/2
676	Black	24	60-1/2
677	Black	24	51
678	Black	24	51
679	Black	24	60-1/2
680	Black	24	60-1/2
681	Black	24	51
682	Black	24	51
683	Black	24	51
684	Black	24	51
685	Black	24	51
686	Black	24	51
687	Black	24	51
688	Black	24	60-1/2
689	Black	24	60-1/2
690	Black	24	51
691	Black	24	60-1/2
692	Black	24	60-1/2
693	Black	24	60-1/2
694	Black	24	60-1/2
695	Black	24	41
696	Black	24	37-1/2
697	Black	24	51
698	Black	24	41
699	Black	24	51
700	Black	24	51
701	Black	24	51
702	Black	24	51
703	Black	24	51
704	Black	24	51
705	Black	24	60-1/2
706	Black	24	60-1/2
707	Black	24	60-1/2

FIG. & INDEX NO.	PART NUMBER			S V C	DESCRIPTION	UNITS PER ASSEMBLY			
8-45-					OPTIONAL RACK AND SHELVES, 16x16 Sterilizer	X			
					OPTIONAL RACK AND SHELVES, 20x20 Sterilizer		X		
	P	136800	011		RACK ASSEMBLY	X			
	P	136800	010		RACK ASSEMBLY		X		
1	P	136800	035		• RACK WELDMENT, R.H.	1			
	P	136800	036		• RACK WELDMENT, L.H.	1			
1	P	136800	032		• RACK WELDMENT, R.H.		1		
	P	136800	033		• RACK WELDMENT, L.H.		1		
2	P	91291	061		• RACK RETAINING TUBE	4	6		
3	P	8649	061		• NUT, Hex	8	12		
4	P	96358	068		SHELF, Bottom, 14x24 x 5/8	1			
	P	139650	068		SHELF, Bottom, 18-1/8 x 36 x 3/4		1		
5	P	96359	068		SHELF, Center, 15 x 24 x 5/8	1			
	P	139651	068		SHELF, Center, 19 x 36 x 3/4		1		
6	P	96724	068		HALF SHELF, 15 x 12-7/8 x 5/8	1			
	P	139922	068		HALF SHELF, 19 x 18-11/16 x 3/4		1		

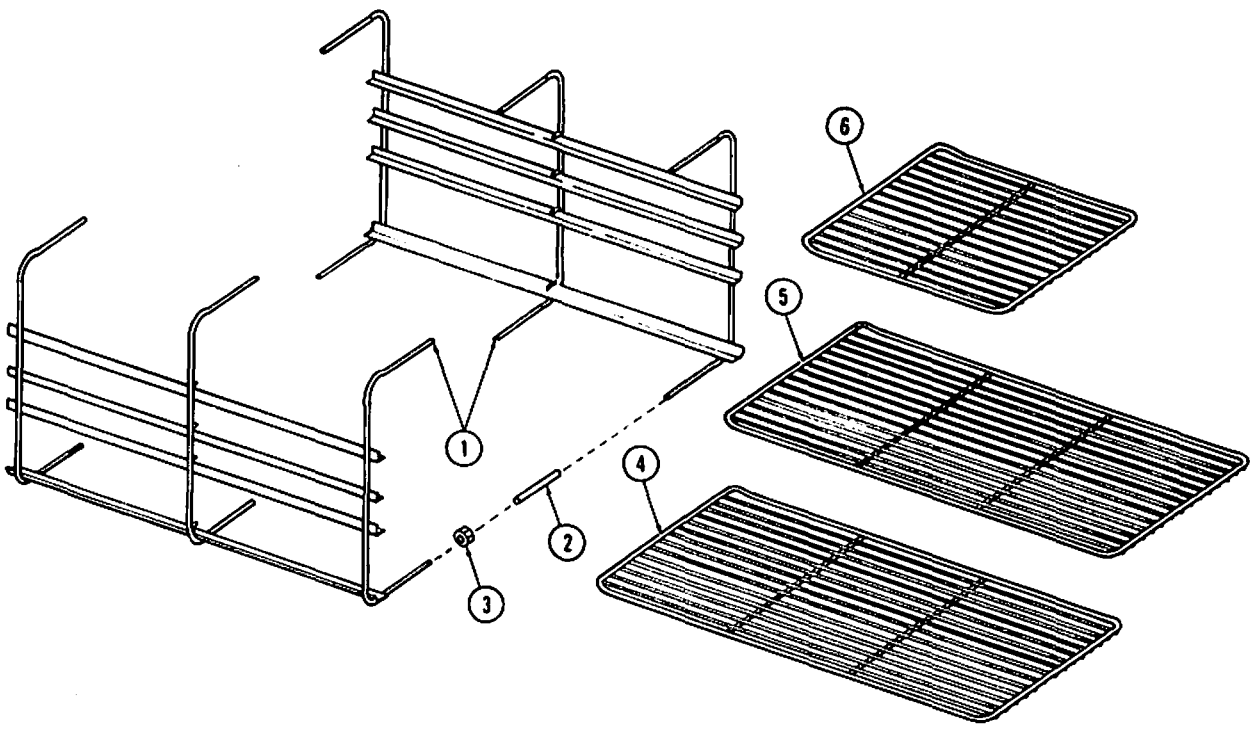


Figure 8-45. OPTIONAL RACK AND SHELVES.

FIG. & INDEX NO.	PART NUMBER			SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-46-	P	54448	091		OPTIONAL LOADING CAR ASSEMBLY, 20x20 Sterilizer	1
1	P	30420	063		ANGLE	2
2	P	30422	063		SHELF	2
3	P	30414	063		FRAME	1
4	P	24956	061		ROLL PIN	4
5	P	30418	061		WHEEL	4
6	P	30417	091		BUSHING	4
7	P	30416	061		AXLE	2

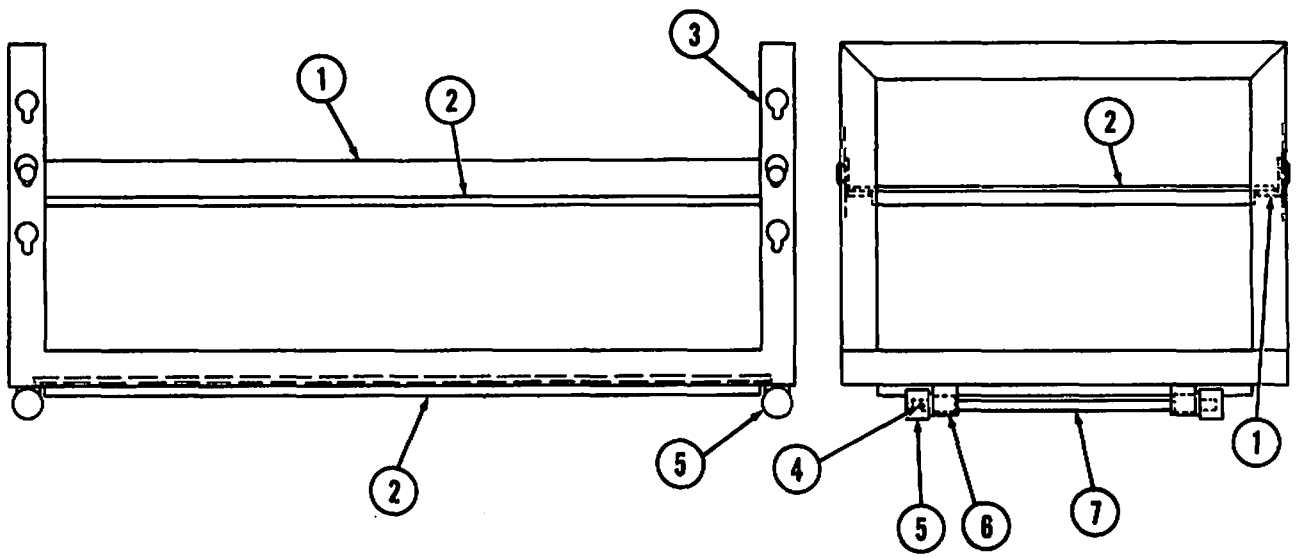


Figure 8-46. OPTIONAL LOADING CAR ASSEMBLY.

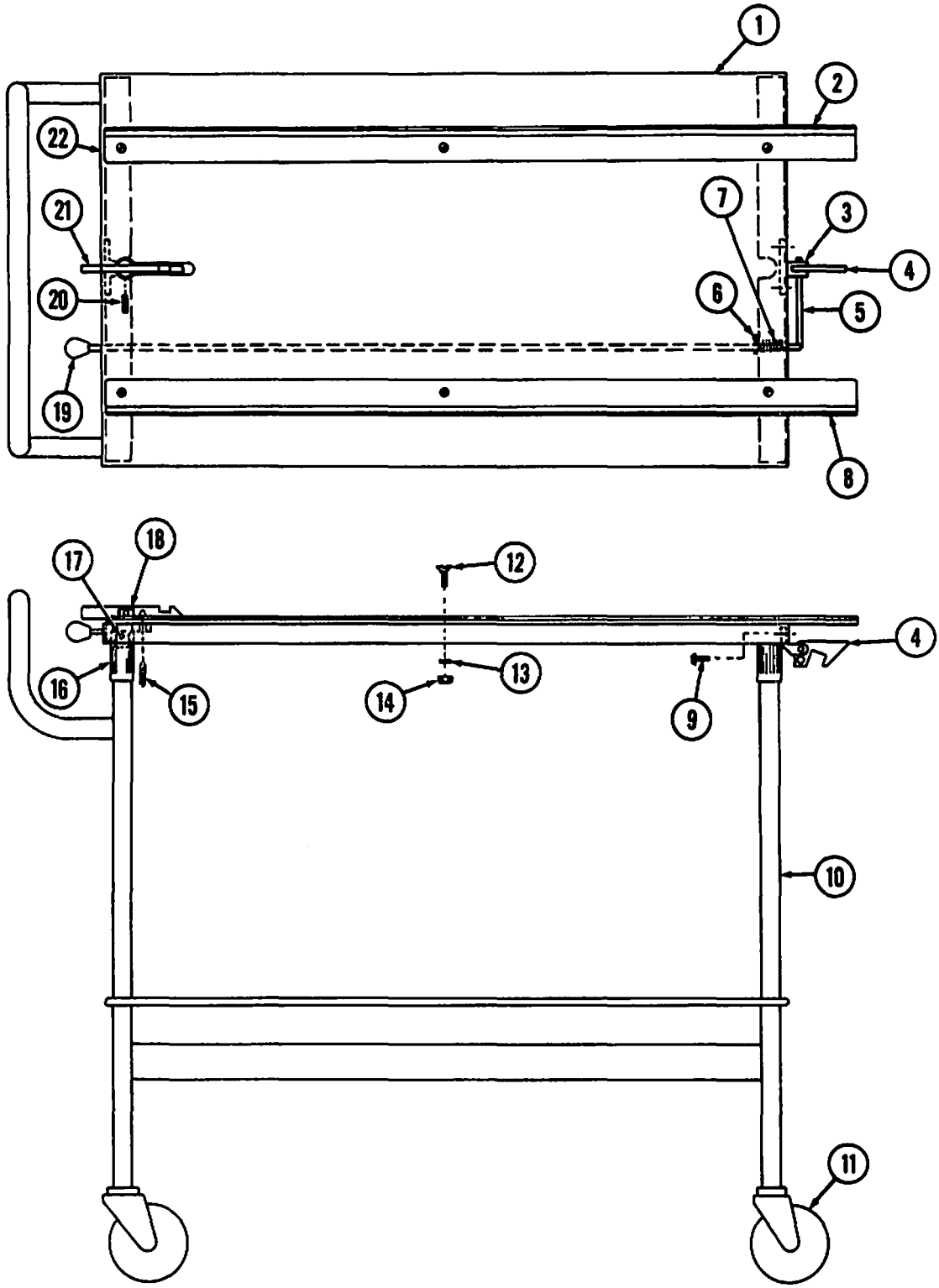


Figure 8-47. OPTIONAL TRANSFER CARRIAGE ASSEMBLY.

FIG. & INDEX NO.	PART NUMBER		SVC	DESCRIPTION	UNITS PER ASSEMBLY
8-47-	P	139693 001		OPTIONAL TRANSFER CARRIAGE ASSEMBLY, 20x20 Sterilizer .	X
1	P	30459 063		TOP	1
2	P	30444 063		TRACK, Right Hand	1
3	P	30440 051		CATCH BLOCK	1
4	P	30447 063		CATCH, Door Frame	1
5	P	30449 061		CATCH ROD	1
6	P	23597 061		COTTER PIN	1
7	P	30458 061		SPRING	1
8	P	30455 063		TRACK, Left Hand	1
9	P	3999 041		SCREW, 1/4-20 x 5/8	4
10	P	139692 063		STAND ASSEMBLY	1
11	P	20542 091		CASTER	4
12	P	12549 062		SCREW, 1/4-20 x 5/8	6
13	P	19686 061		LOCKWASHER	6
14	P	8648 061		HEX NUT	6
15	P	30457 061		SPRING, Lock Lever	1
16	P	30446 052		ADJUSTING COLLAR	4
17	P	4772 045		SCREW, Set, 1/4-20 x 1/4	4
18	P	30448 051		BLOCK, Lock Lever	1
19	P	14918 091		KNOB	1
20	P	24268 061		ROLL PIN	2
21	P	30415 063		LOCK LEVER	1
22	P	30441 061		ANGLE ASSEMBLY	2